SUZUKI

SX306

SERVICE MANUAL

SUZUKI
Caring for Customers
99500-80F00-01E
(英)

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING**, **CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

WARNING:
Indicates a potential hazard that could result in death or injury.

CAUTION:
Indicates a potential hazard that could result in vehicle damage.

NOTE:
Indicates special information to make maintenance easier or instructions clearer.

FOREWORD

This manual contains procedures for diagnosis, maintenance, adjustments, minor service operations, replacement of components (Service) and for disassembly and assembly of major components (Unit Repair-Overhaul).

Applicable model: SX306

The contents are classified into sections each of which is given a section number as indicated in the Table of Contents on next page. And on the first page of each individual section is an index of that section.
This manual should be kept in a handy place for ready reference of the service work. Strict observance of the so specified items will enable one to obtain the full performance of the vehicle.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials (lubricant, sealants, etc.) as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others. Therefore, note that illustrations may differ from the vehicle being actually serviced. The right is reserved to make changes at any time without notice.

SUZUKI MOTOR CORPORATION
TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

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SECTION 0A

GENERAL INFORMATION

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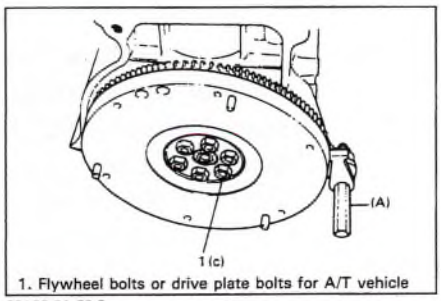
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HOW TO USE THIS MANUAL

1. There is a table of contents for the whole manual on the first page of this manual, whereby you can easily find the section that offers the information you need. Also, there is a table of contents on the first page of each section, where the main items in that section are listed.
2. Each section of this manual has its own pagination. It is indicated at the top of each page along with the Section name.
3. The special tool usage and torque specification are given as shown in figure below.



1. Flywheel bolts or drive plate bolts for A/T vehicle

60A20-6A-72-5

6. Install oil pump. Refer to Item "Oil pump" for installation of oil pump.
7. Install flywheel (M/T vehicle) or drive plate (A/T vehicle). Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts to specification.

Special Tool
(A): 09924-17810

Tightening Torque
(c): 68—72 N·m (6.8—7.2 kg-m, 49.5—52.0 lb-ft)

64B40-0A-1-2

4. A number of abbreviations are used in the text. For their full explanations, refer to **"ABBREVIATIONS USED IN THIS MANUAL"** on the page 0A-3 of this section.
5. The SI and metric systems are used as units in this manual.
6. DIAGNOSIS and CORRECTION are included in each section as necessary.
7. At the end of each section, there are descriptions of SPECIAL TOOLS, REQUIRED SERVICE MATERIALS and RECOMMENDED TORQUE SPECIFICATIONS that should be used for the servicing work described in that section.

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ABBREVIATIONS USED IN THIS MANUAL

A

- ATDC : After Top Dead Center
- API : American Petroleum Institute
- ATF : Automatic Transmission Fluid
- ALR : Automatic Locking Retractor
- AC : Alternating Current
- A/T : Automatic Transmission
- A/C : Air Conditioning
- A/C SV Valve : Air Conditioning Solenoid Vacuum Valve (A/C Vacuum Switching Valve, A/C VSV)
- ABDC : After Bottom Dead Center
- A/F : Air Fuel Mixture Ratio
- A-ELR : Automatic-Emergency Locking Retractor
- ABV : Air Bypass Valve

B

- B+ : Battery Positive Voltage
- BTDC : Before Top Dead Center
- BBDC : Before Bottom Dead Center

C

- CMP Sensor : Camshaft Position Sensor (Crank Angle Sensor, CAS)
- CO : Carbon Monoxide
- CPP Switch : Clutch Pedal Position Switch (Clutch Switch, Clutch Start Switch)
- CPU : Central Processing Unit
- CRS : Child Restraint System

D

- DC : Direct Current
- DLC : Data Link Connector (Assembly Line Diag. Link, ALDL, Serial Data Link, SDL)
- DOHC : Double Over Head Camshaft
- DOJ : Double Offset Joint
- DRL : Daytime Running Light
- DTC : Diagnostic Trouble Code (Diagnostic Code)

E

- ECM : Engine Control Module
- ECT Sensor : Engine Coolant Temperature Sensor (Water Temp. Sensor, WTS)
- EGR : Exhaust Gas Recirculation
- EGR Modulator : EGR Vacuum Modulator
- EGR SV Valve : EGR Solenoid Vacuum Valve (EGR Vacuum Switching Valve, EGR VSV)
- EGRT Sensor : EGR Temperature Sensor (Recirculated Exhaust Gas Temp. Sensor, REGTS)
- ELR : Emergency Locking Retractor
- ESA : Electronic Spark Advance
- EVAP : Evaporative Emission
- EVAP Canister : Evaporative Emission Canister (Chacoal Canister)
- EVAP SP Valve : EVAP Solenoid Purge Valve
- EVAP TVV : EVAP Thermal Vacuum Valve (Bimetal Vacuum Switching Valve, BVSV)

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F

- FIA Valve : Fast Idle Air Valve (Air Valve)
- 4WD : 4 Wheel Drive

G

- GEN : Generator
- GND : Ground

H

- HC : Hydrocarbons
- HO2S : Heated Oxygen Sensor

I

- IAC Valve : Idle Air Control Valve (Idle Speed Control Solenoid Valve, ISC Solenoid Valve)
- IAT Sensor : Intake Air Temperature Sensor (Air temperature Sensor, ATS)
- IG : Ignition
- ISA Screw : Idle Speed Adjusting Screw

L

- LH : Left Hand

M

- MAF Sensor : Mass Air Flow Sensor (Air Flow Sensor, AFS, Air Flow Meter, AFM)
- MAP Sensor : Manifold Absolute Pressure Sensor (Pressure Sensor, PS)
- Max : Maximum
- MFI : Multiport Fuel Injection (Multipoint Fuel Injection)
- Min : Minimum
- MIL : Malfunction Indicator Lamp (''CHECK ENGINE'' Light)
- M/T : Manual Transmission

N

- NOx : Nitrogen Oxides

O

- OBD : On-Board Diagnostic System (Self-Diagnosis Function)
- OHC : Over Head Camshaft
- O2S : Oxygen Sensor

P

- P/S : Power Steering
- PSP Switch : Power Steering Pressure Switch (P/S Pressure Switch)
- PCV : Positive Crankcase Ventilation

R

- RFC Relay : Radiator Fan Control Relay (Radiator Fan Motor Relay)
- RH : Right Hand

S

- SAE : Society of Automotive Engineers
- SFI : Sequential Multiport Fuel Injection
- SOHC : Single Over Head Camshaft
- SV Valve : Solenoid Vacuum Valve

T

- TBI : Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)
- TCC : Torque Converter Clutch
- TCM : Transmission Control Module (A/T Controller, A/T Control Module)
- TO SV Valve : Throttle Opener Solenoid Vacuum Valve (Throttle Opener Vacuum Switching Valve)
- TP Sensor : Throttle Position Sensor
- TPC Valve : Tank Pressure Control Valve (2-Way Check Valve)
- TVV : Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching Valve, BVSV)
- TWC : Three Way Catalytic Converter (Three Way Catalyst)
- 2WD : 2 Wheel Drive
- TP Switch : Throttle Position Switch

V

- VIN : Vehicle Identification Number
- VSS : Vehicle Speed Sensor

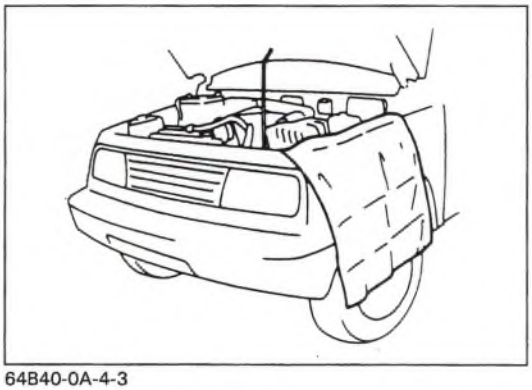
GENERAL PRECAUTIONS

The WARNING and CAUTION below describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures described in this manual, and they will not necessarily be repeated with each procedure to which they apply.

WARNING:

- **Whenever raising a vehicle for service, be sure to follow the instructions under ''VEHICLE LIFTING POINTS'' on SECTION 0A.**
- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles), Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.**
- **When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.**
- **Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.**
- **To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tailpipe, muffler, etc.**

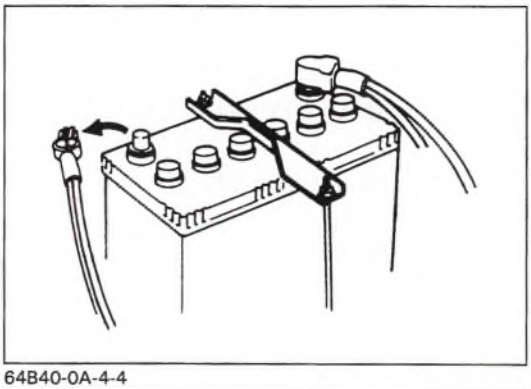
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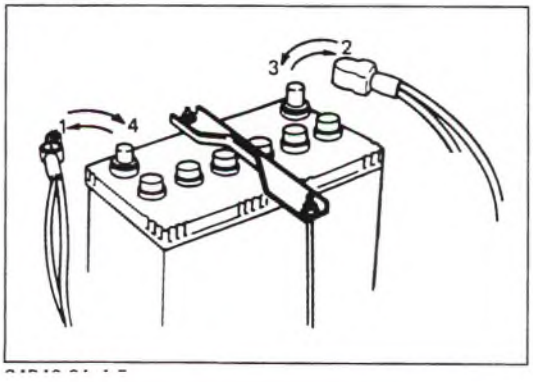
CAUTION:

- **Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g, buttons) may cause damage to the vehicle's finish.**

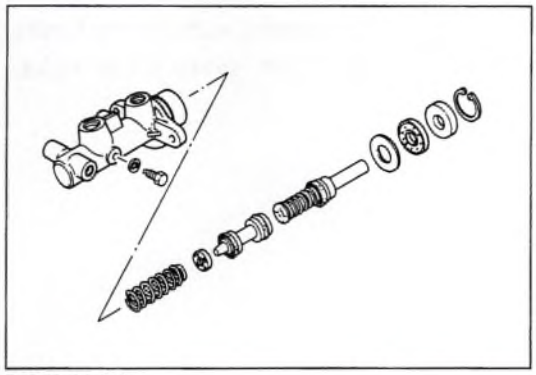


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- **When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.**

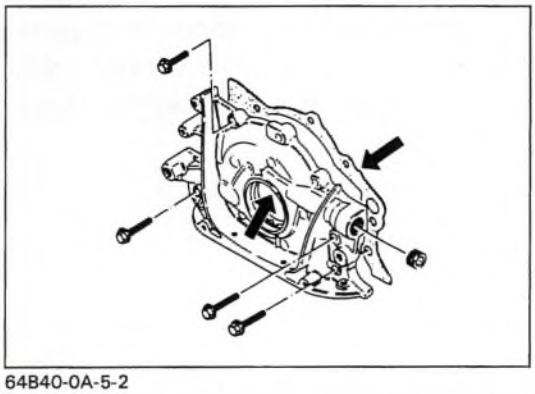


- **When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal covers.**



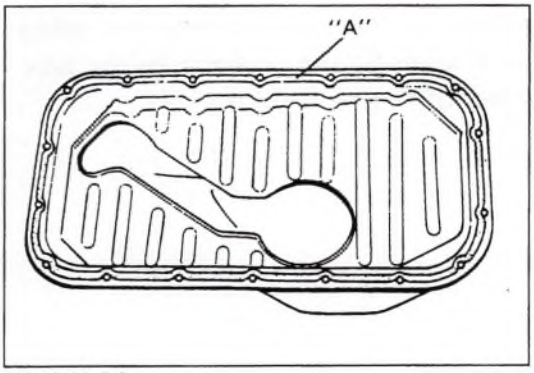
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- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.



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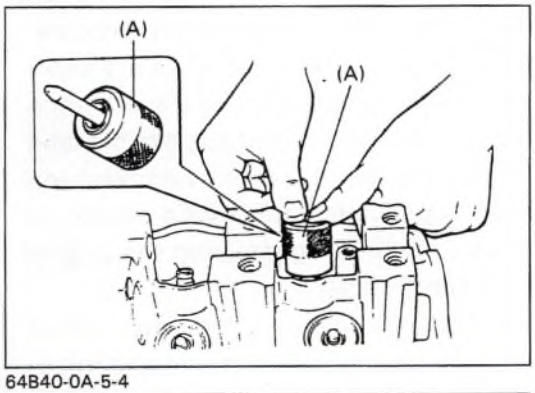
- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material form the mating surfaces.



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- Make sure that all parts used in reassembly are perfectly clean.
- When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.

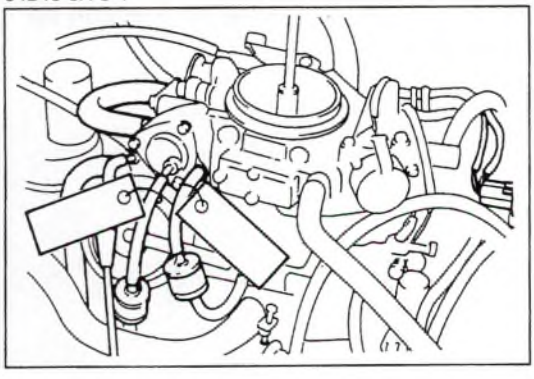
"A": Sealant 99000-31150



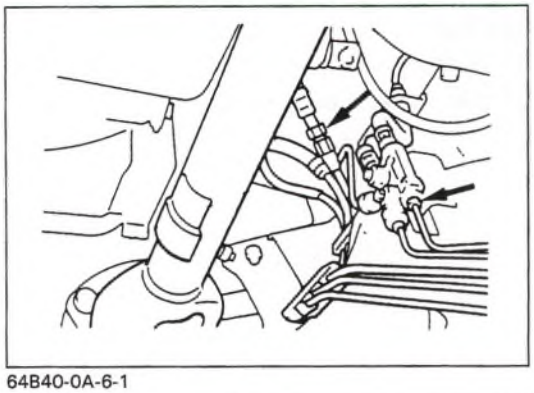
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- Be sure to use special tools when instructed.

Special Tool
(A): 09917-98210

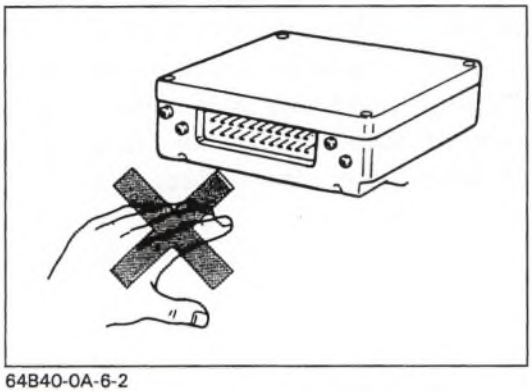


- When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.



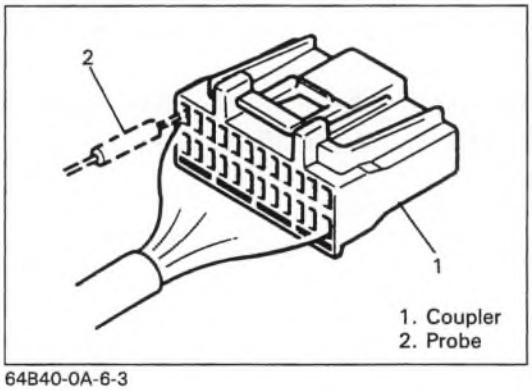
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- **After servicing fuel, oil, water, vacuum, exhaust or brake systems, check all lines related to the system for leaks.**



64B40-0A-6-2

- **Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit). The static electricity from your body can damage these parts.**



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- **When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector.**

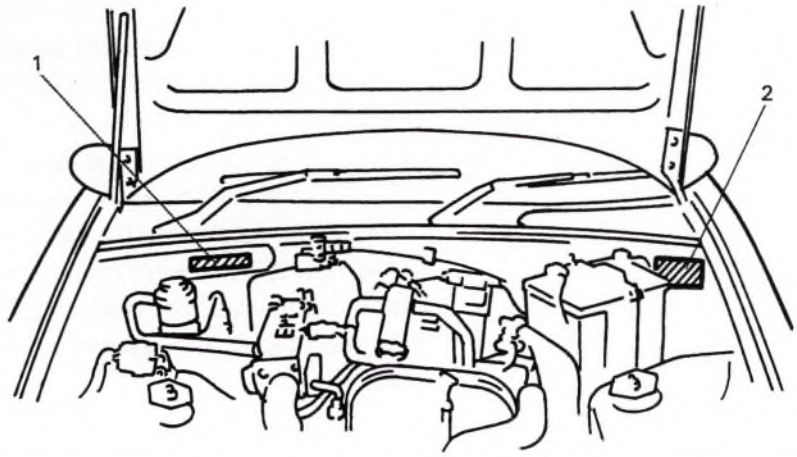
- **For vehicles equipped with a catalytic converter, be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged. Conduct a spark jump test only when necessary, make it as short as possible, and do not open the throttle. Conduct engine compression checks within the shortest possible time. Avoid situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty).**
- **For vehicles equipped with fuel injection systems, never disconnect the fuel line between the fuel pump and injector without first releasing the fuel pressure, or fuel can be sprayed out under pressure.**

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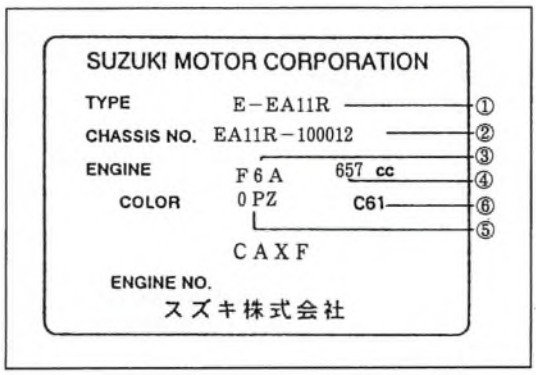
IDENTIFICATION INFORMATION

BODY NUMBER AND ID PLATE LOCATION

The body number is on the right top of the dash panel and ID plate is on the left top of the dash panel.



1. Body number
2. ID plate

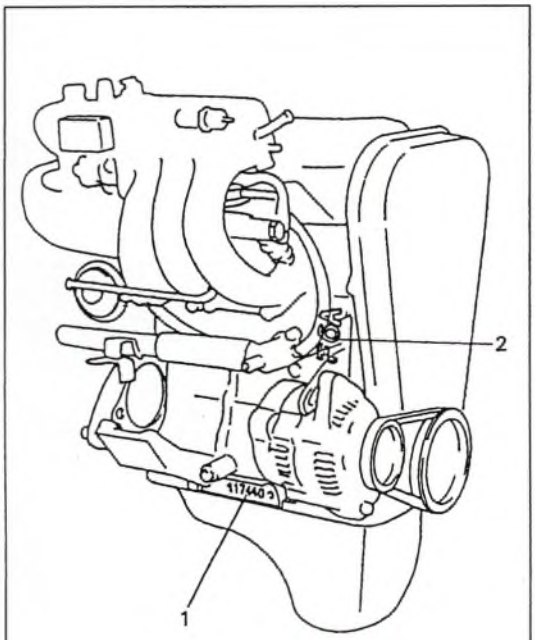


ID PLATE

① Vehicle type
② Body number
③ Engine type
④ Engine displacement
⑤ Body color code
⑥ Body/interior color code

ENGINE IDENTIFICATION NUMBER

The number is made/punched on the cylinder block.



1. Sequential number
2. Engine type

F6A 100001

Sequential number

Engine type

METRIC INFORMATION

METRIC FASTENERS

Most of the fasteners used for this vehicle are metric. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

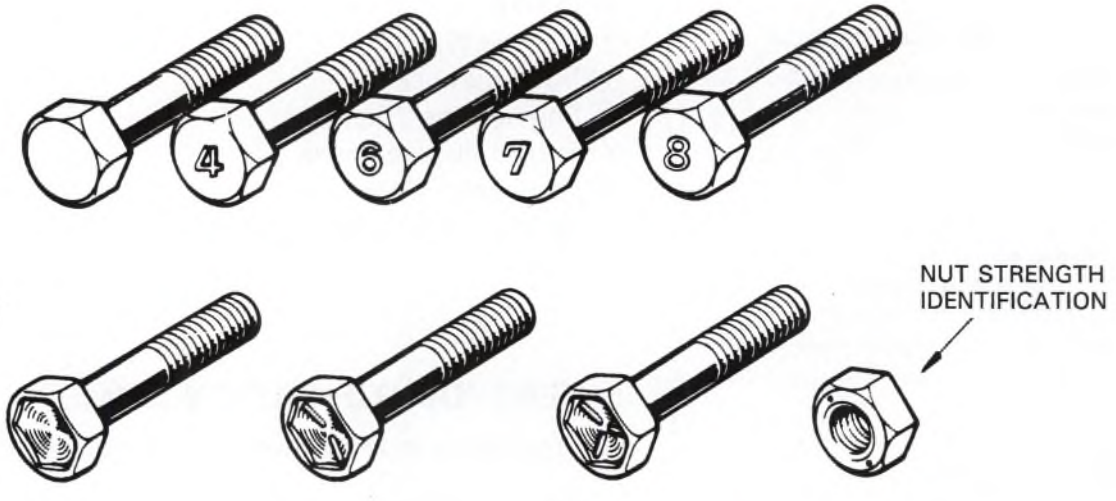
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FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 4T, 7T and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch mark strength identification on the nut face. Figure shows the different strength markings.

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct size. Correct replacement bolts and nuts are available through the parts division.

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METRIC BOLTS—IDENTIFICATION CLASS NUMBERS OR MARKS CORRESPOND TO BOLT STRENGTH—INCREASING NUMBERS REPRESENT INCREASING STRENGTH.

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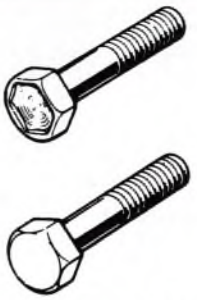
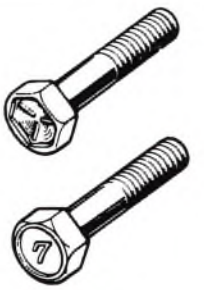
STANDARD TIGHTENING TORQUE

Each fastener should be tightened to the torque specified in each section of this manual. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE:

- **For the flanged bolt and nut, add 10% to the tightening torque given in the chart below.**
- **The chart below is applicable only where the fastened parts are made of steel or light alloy.**

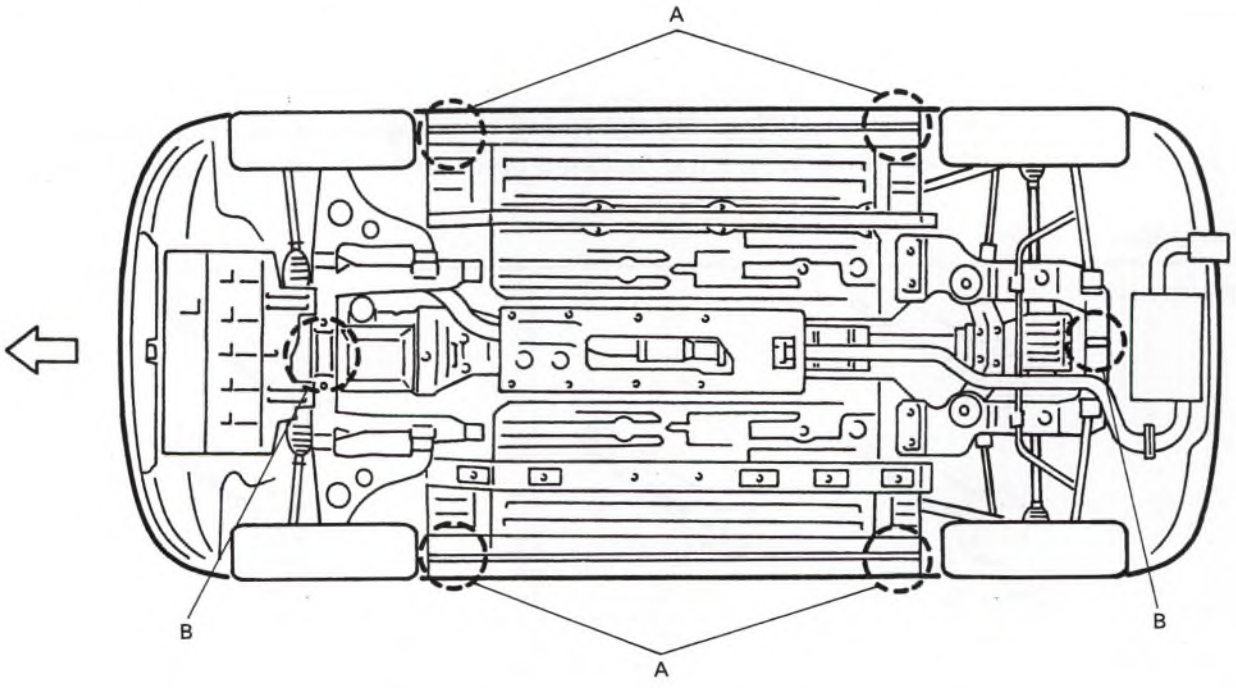
Tightening torque chart

STRENGTH / THREAD DIAMETER (mm)	 Conventional bolt	 "4T" bolt	 "7T" bolt	
	N·m	kg-m	N·m	kg-m
4	1—2	0.1—0.2	1.5—3.0	0.15—0.30
5	2—4	0.2—0.4	3—6	0.3—0.6
6	4—7	0.4—0.7	8—12	0.8—1.2
8	10—16	1.0—1.6	18—28	1.8—2.8
10	22—35	2.2—3.5	40—60	4.0—6.0
12	35—55	3.5—5.5	70—100	7.0—10.0
14	50—80	5.0—8.0	110—160	11.0—16.0
16	80—130	8.0—13.0	170—250	17.0—25.0
18	130—190	13.0—19.0	200—280	20.0—28.0

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VEHICLE LIFTING POINTS

The following figure shows support positions when lifting the vehicle with a hoist and with a floor jack.



A: Support position when using frame contact hoist and safety stand
B: Support position when using floor jack

WARNING:

- **When using frame contact hoist, apply hoist as shown above (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**
- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending on what part to be removed.**
- **Make absolutely sure to lock hoist after vehicle is hoisted up.**
- **If the vehicle is jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety. After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone.**

SECTION 0B

MAINTENANCE AND LUBRICATION

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MAINTENANCE SCHEDULE

NORMAL CONDITION SCHEDULE

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	Km (x 1,000)	10	20	30	40	50	60	70	80
	Miles (x 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
1. ENGINE									
1-1. Generator bolt (tension, damage)		—	I	—	R	—	I	—	R
1-2. Camshaft timing belt		Replace every 100,000 km (60,000 miles)							
1-3. Engine oil and Engine oil filter	Oil: API Grade SF, SG or SH class	Replace every 5,000 km (3,000 miles)/6 months							
	Filter	R	R	R	R	R	R	R	R
1-4. Cooling system hoses and connections (leakage, damage)		—	I	—	I	—	I	—	I
1-5. Engine coolant		—	—	—	R	—	—	—	R
1-6. Exhaust system (leakage, damage, tightness)		—	I	—	I	—	I	—	I
1-7. Wiring harness and connections		—	—	—	I	—	—	—	I
2. IGNITION SYSTEM									
2-1. Spark plugs		—	R	—	R	—	R	—	R
2-2. Distributor cap and rotor (crack, wear)		—	—	—	I	—	—	—	I
2-3. Ignition wiring		—	—	—	I	—	—	—	R
2-4. Ignition timing		(I)	—	—	I	—	—	—	I
3. FUEL SYSTEM									
3-1. Air cleaner filter element	Paved-road	—	I	—	R	—	I	—	R
	Dusty condition	Refer to "Severe Driving Condition" schedule							
3-2. Engine idle speed		(I)	I	—	I	—	I	—	I
3-3. Fuel tank, cap & lines (deterioration, leakage, damage)		—	—	—	I	—	—	—	I
4. EMISSION CONTROL SYSTEM									
4-1. EVAP canister		—	—	—	—	—	—	—	I
5. BRAKE									
5-1. Brake discs and pads (thickness, wear, damage)		I	—	I	—	I	—	I	—
5-2. Brake hoses and pipes (leakage, damage, clamp)		I	—	I	—	I	—	I	—
5-3. Brake fluid		—	I	—	R	—	I	—	R
5-4. Brake lever and cable (damage, stroke, operation)		I	—	I	—	I	—	I	—
5-5. Brake pedal		—	I	—	I	—	I	—	I
6. CHASSIS AND BODY									
6-1. Clutch pedal free travel		I	I	I	I	I	I	I	I
6-2. Tires/wheel discs (wear, damage, rotation)		I	I	I	I	I	I	I	I
6-3. Drive axle boots (breakage, damage)		I	I	I	I	I	I	I	I
6-4. Suspension system (tightness, damage, rattle, breakage)		I	I	I	I	I	I	I	I
6-5. Steering system (tightness, damage, breakage, rattle)		I	I	I	I	I	I	I	I
6-6. Propeller shafts		—	I	—	I	—	I	—	I
6-7. Transmission oil and differential oil (leakage, level)		I	R	I	R	I	R	I	R
6-8. Door hinges & Gear shift control lever/shaft		I	I	I	I	I	I	I	I

"R": Replace or change
"I" : Inspect and correct or replace if necessary

Item 2-4 (I) and Item 3-2 (I) are applicable only to the 10,000 km inspection.

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

A — Repeated short trips
B — Driving on rough and/or muddy roads
C — Driving on dusty roads
D — Driving in extremely cold weather and/or salted roads
E — Repeated short trips in extremely cold weather

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
A — C D E —	Engine oil and oil filter	R	Every 3,000 km (1,875 miles) or 3 months
— — C — — —	Air cleaner filter element *1	I	Every 2,500 km (1,500 miles)
		R	Every 40,000 km (24,000 miles) or 24 months
— — — D — —	Fuel tank, cap and lines	I	Every 20,000 km (12,000 miles) or 12 months
A B C — E —	Brake discs and pads	I	Every 10,000 km (6,000 miles) or 6 months
A B — D E —	Brake hoses and pipes	I	Every 10,000 km (6,000 miles) or 6 months
— B C D — —	Wheel bearings	I	Every 20,000 km (12,000 miles) or 12 months
— B C D — —	Propeller shafts	I	Every 10,000 km (6,000 miles) or 6 months

NOTE:
I — Inspect and correct or replace if necessary
R— Replace or change

**1: Inspect or replace more frequently if the vehicle is used under dusty conditions.*

MAINTENANCE SERVICE

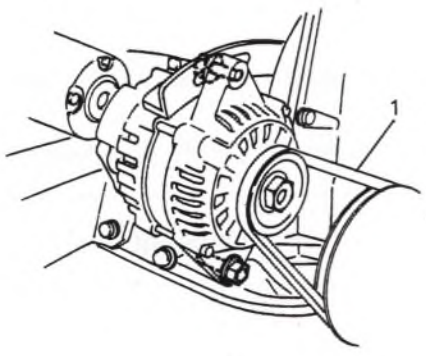
ENGINE

ITEM 1-1

Generator Belt Inspection

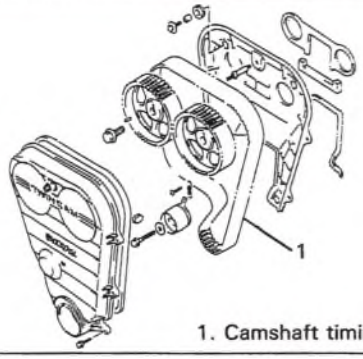
WARNING:
Disconnect negative cable at battery before checking and adjusting belt tension.

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. Replace, if necessary.
2) Check generator belt for tension and adjust it as necessary. Refer to SECTION 6H for its procedure.



1. Generator belt

64B40-0B-4-1



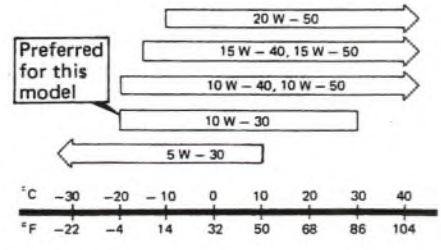
1. Camshaft timing belt

ITEM 1-2

Camshaft Timing Belt Replacement

Replace camshaft timing belt. Refer to SECTION 6A for replacement procedure.

Proper Engine Oil Viscosity Chart

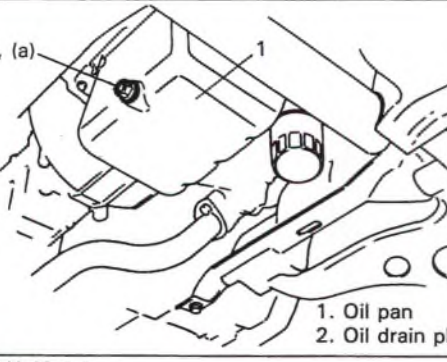


64B40-0B-4-3

ITEM 1-3

Engine Oil and Filter Change

It is recommended to use engine oil of API grade SF, SG or SH class.
Select the appropriate oil viscocity according to the left chart.
Always change oil and oil filter as soon as possible after driving in a dust storm.
See your Owner's Manual for further details.

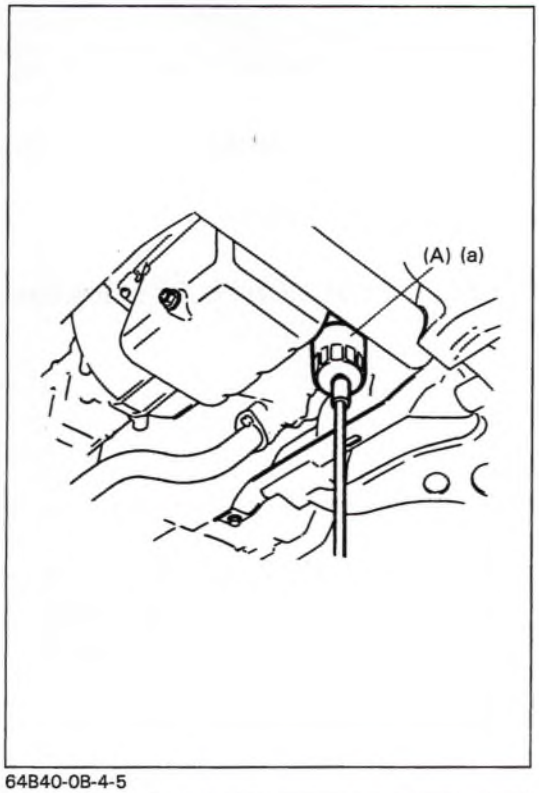


1. Oil pan
2. Oil drain plug

64B40-0B-4-4

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to following work.
1) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

Tightening Torque
(a): 30—40 N·m (3.0—4.0 kg-m)



64B40-0B-4-5

3) Loosen oil filter by using oil filter wrench (Special tool).

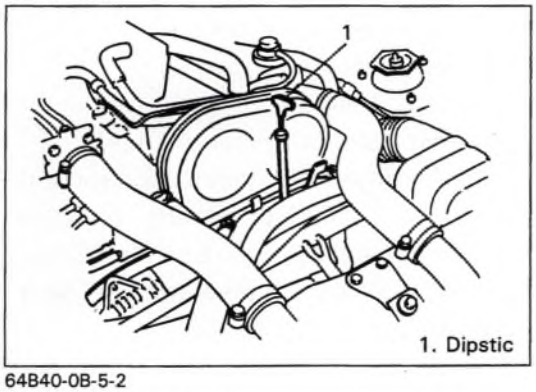
Special Tool
(A): 09915-47340

NOTE:
Before fitting new oil filter, be sure to apply engine oil to its "O" ring.

4) Screw new filter on oil filter stand by hand until filter "O" ring contacts mounting surface.
5) Using oil filter wrench (special tool), tighten filter to specification.

Special Tool
(A): 09915-47340

Tightening Torque
(a): 12—16 N·m (1.2—1.6 kg-m)



64B40-0B-5-2

6) Replenish oil until oil level is brought to FULL level mark on dipstic. (about 3.0 liters). Filler inlet is at the top of cylinder head cover.
7) Start engine and run it for three minutes. Stop it and wait another 3 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dipstick.

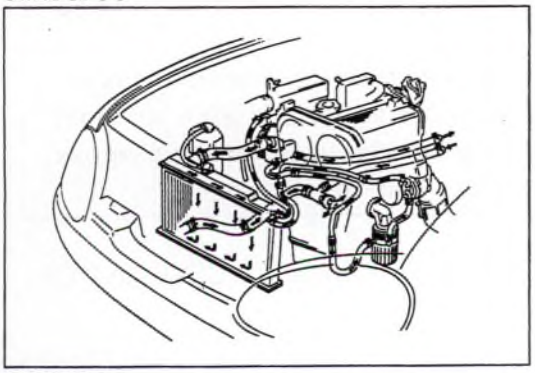
Engine oil capacity

Oil pan capacity	about 2.8 liters
Oil filter capacity	about 0.2 liters
Others	about 0.4 liters
Total	about 3.4 liters

NOTE:
Engine oil capacity is specified as left table.
However, note that amount of oil required when actually changing oil may somewhat differ from data in left table depending on various conditions (temperature, viscosity, etc.).

8) Check oil filter and drain plug for oil leakage.

64B40-0B-5-3



64B40-0B-5-4

ITEM 1-4

Cooling System, Hoses and Connections Inspection

1) Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.
2) Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.

3) Clean frontal area of radiator core.
4) Test system and radiator cap for proper pressure holding capacity, 0.9 kg/cm².
 If replacement cap is needed, use a cap designed for cooling system of this car.
5) Check coolant level and concentration.
 Add if necessary.
 Refer to COOLANT LEVEL of SECTION 6B for procedure of level check.

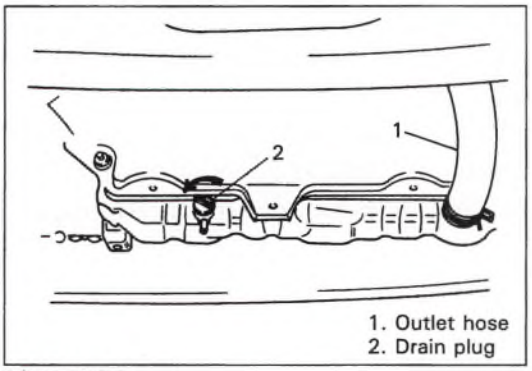
64B40-0B-5-5

ITEM 1-5

Engine Coolant Change

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

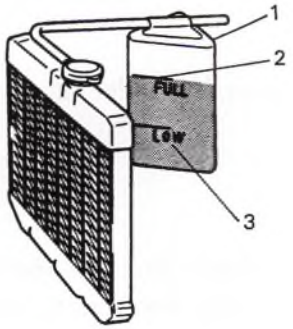
64B40-0B-6-1



1. Outlet hose
2. Drain plug

1) Remove radiator cap when engine is cool.
2) Loosen radiator drain plug to drain coolant.
3) Remove reservoir tank, and drain.
4) Tighten plug securely. Also reinstall reservoir tank.
5) Fill radiator with specified amount of coolant, and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system. STOP ENGINE. Add coolant as necessary until coolant level reaches filler throat of radiator. Reinstall radiator cap.

64B40-0B-6-2



1. Reservoir tank
2. FULL level mark
3. LOW level mark

64B40-0B-6-4

6) Add coolant to reservoir tank so that its level aligns with Full mark. Then, reinstall cap.

CAUTION:
When changing engine coolant, use mixture of 50% water and 50% ethylene-glycol base coolant (Anti-Freeze/Anti-corrosion coolant) for the market where ambient temperature falls lower than −16°C (3°F) in winter and mixture of 70% water and 30% ethylene-glycol base coolant for the market where ambient temperature doesn't fall lower than −16°C (3°F).
Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylne-glycol base coolant should be used for the purpose of corrosion protection and lubrication.

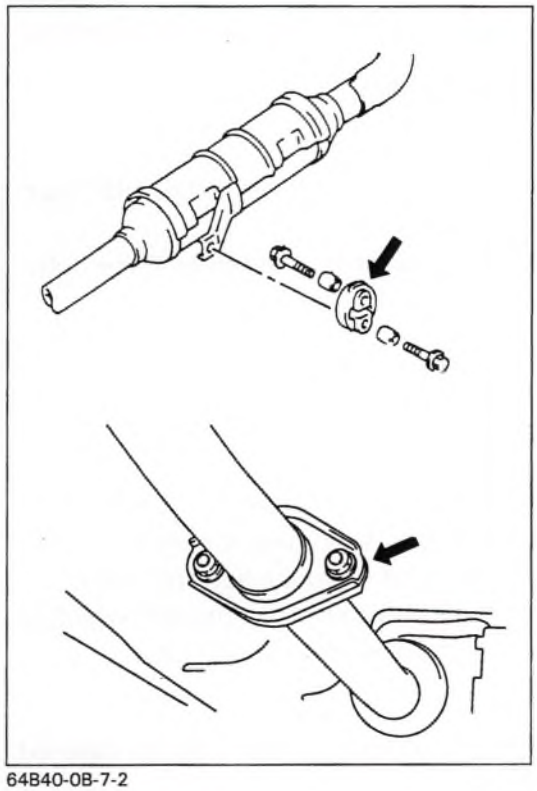
Refer to SECTION 6B of this manual for COOLANT CAPACITY.

ITEM 1-6

Exhaust System Inspection

> **WARNING:**
> **To avoid danger of being burned, do not touch exhaust system when it is still hot.**
> **Any service on exhaust system should be performed when it is cool.**

64B40-0B-7-1



64B40-0B-7-2

When carrying out periodic maintenance or vehicle is raised for other service, check exhaust system as follows:

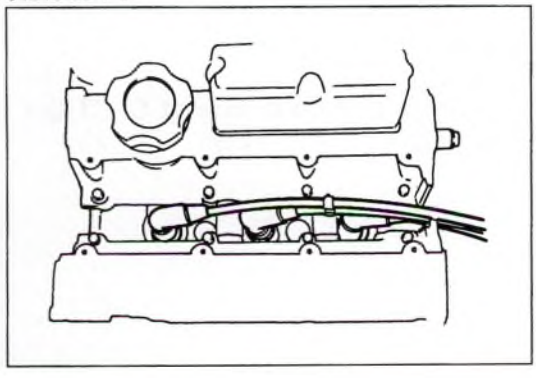
- Check rubber mountings for damage and deterioration.
- Check muffler pipe for leakage, loose connections, dents, and damages.
 If bolts or nuts are loose, tighten them to specification. Refer to SECTION 6K for torque specification of bolts and nuts.
- Check nearby body areas for damaged, missing or mispositioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to floor carpet.
- Any defects should be fixed at once.

ITEM 1-7

Wiring Harness and Connections Inspection

1) Visually inspect all wires in engine compartment for evidence of breakage.
 Inspect condition of insulation (cracks). All clips and clamps should have solid connections to wires.
2) Replace any wires in a deteriorated or otherwise defective condition.

64B40-0B-7-4



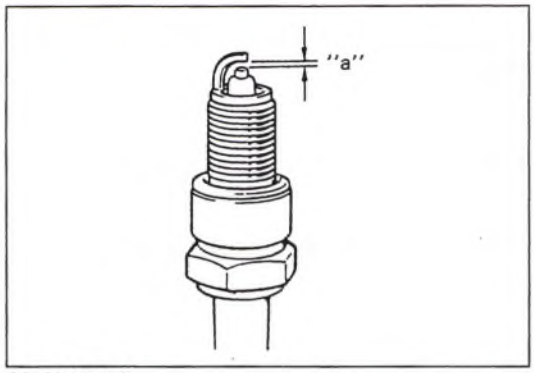
IGNITION SYSTEM

ITEM 2-1

Spark Plugs Replacement

Replace spark plugs as follows:

1) Remove breather hose bolts (3 pcs.) and camshaft housing cover.
2) Dust off cylinder head around spark plugs.
3) Disconnect high-tension cords at spark plugs.
 To avoid inside damage of cords, DO NOT pull on cords for disconnection. Pull on boots.



64B40-0B-8-2

4) Using a spark plug wrench, remove spark plugs.
5) Check plug gaps of new spark plugs, and adjust them to specification as necessary.

Air gap "a": 0.7—0.8 mm

Plug type : NGK DCP 7EVX
NIPPONDENSO XU22EP-ZU

6) Install new spark plugs. Tighten plugs to specification.

Tightening Torque for spark plug:
10—20 N·m (1.0—2.0 kg-m)

7) Connect high-tension cords to spark plugs. DO NOT push cords for connection. Push boots.
8) Install camshaft housing cover and breather hose bolts.

64B40-0B-8-3

ITEM 2-2

Distributor Cap and Rotor Inspection

1) Inspect distributor cap and rubber caps for cracks.
2) Inspect center electrode and terminals for wear.
3) Inspect rotor for cracks, and its electrode for wear.
4) Repair or replace as necessary any component which is found to be in malcondition as described above.

NOTE:
Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

ITEM 2-3

Ignition Wiring (high-tension cord) Replacement

1) Disconnect high-tension cords from spark plugs, ignition coil and distributor.
2) Connect new high-tension cords and clamp them securely. DO NOT push cords for connection. Push boots. Refer to SECTION 6F for high-tension cords distribution.

64B40-0B-8-4

ITEM 2-4

Ignition Timing Inspection

Check ignition timing. Refer to Ignition timing of SECTION 6F for timing check procedure.

FUEL SYSTEM

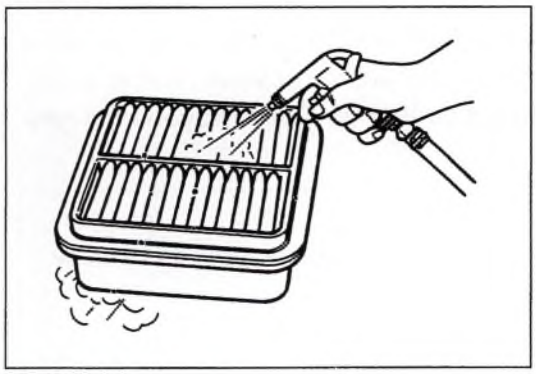
ITEM 3-1

Air Cleaner Element Replacement

NOTE:
Replace more often under dusty conditions. Ask your dealer for proper replacement interval for your driving conditions.

Replace air cleaner element with new one according to procedure described in SECTION 6A.

64B40-0B-9-1



64B40-0B-9-2

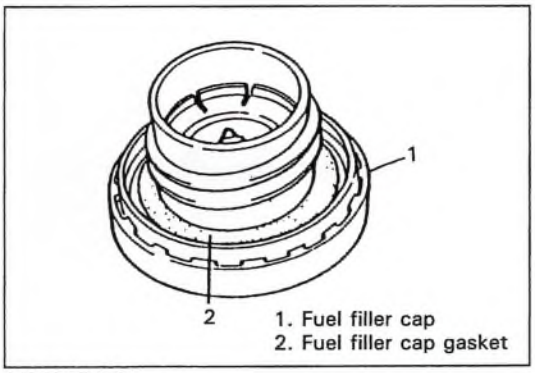
Air Cleaner Element Inspection

1) Visually check that air cleaner element is not excessively dirty, damaged or oily.
2) Clean element with compressed air from air outlet side of element.

ITEM 3-2

Engine Idle Speed Inspection

Check idle speed and adjust it as necessary.
Refer to ON-VEHICLE SERVICE of SECTION 6E for procedures to check idle speed.



1. Fuel filler cap
2. Fuel filler cap gasket

64B40-0B-9-3

ITEM 3-3

Fuel Tank, Cap Gasket and Fuel Lines Inspection

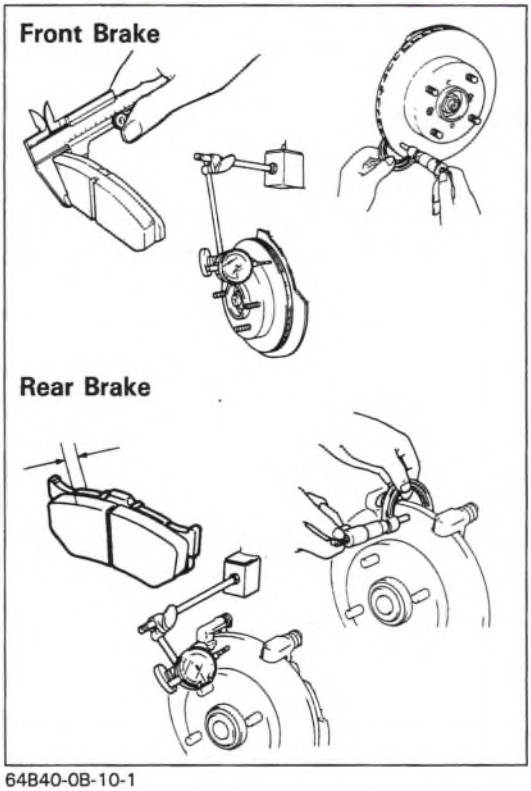
- Check fuel tank, fuel filler cap and fuel lines for loose connection, deterioration or damage which could cause leakage.
 Make sure all clamps are secure.
- Check fuel filler cap gasket for an even filler neck imprint or any damage.
- Replace any damaged or deteriorated parts.
 There should be no sign of fuel leakage or moisture at any fuel connection.

EMISSION CONTROL SYSTEM

ITEM 4-1

EVAP Canister Inspection

Check EVAP canister. Refer to ON-VEHICLE SERVICE of SECTION 6J for procedures to check EVAP canister.



64B40-0B-10-1

BRAKE

ITEM 5-1

Brake Discs and Pads Inspection

1) Remove wheel and caliper but don't disconnect brake hose from caliper.
2) Check disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For the details, refer to SECTION 5.
 Be sure to torque nuts and bolts to specification.

NOTE:
If noise is heard from front brake when brake pedal is depressed, check brake pad lining for wear. If it is worn, both right and left brake pads should be replaced with new ones.

CAUTION:
After replacing any brake pipe or hose, be sure to carry out air purge operation.

ITEM 5-2

Brake Hoses and Pipes Inspection

Perform this inspection where there is enough light and use a mirror as necessary.

- Check brake hoses and pipes for proper hook-up, leaks, cracks, chafing, wear, corrosion bends, twists and other damage.
 Replace any of these parts as necessary.
- Check all clamps for tightness and connections for leakage.
- Check that hoses and pipes are clear of sharp edges, moving parts.

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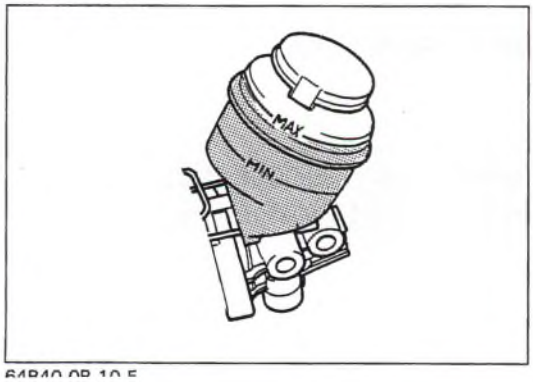
ITEM 5-3

Brake Fluid Inspection and Change

[Inspection]

1) Check around master cylinder and reservoir for fluid leakage.
 If found leaky, correct.

64B40-0B-10-4



64B40-0B-10-5

2) Check fluid level.
 If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.
 For the details, refer to ON-VEHICLE SERVICE of SECTION 5.

CAUTION:
Since brake system of this vehicle is factory-filled with glycol-base brake fluid, do not use or mix different type of fluid when refilling; otherwise serious damage will occur.
Do not use old or used brake fluid, or unsealed container.

64B40-0B-11-1

[Change]
Change brake fluid as follows.
Drain existing fluid from brake system completely, fill system with above recommended fluid and carry out air purge operation.
For air purging procedure, refer to SECTION 5.

64B40-0B-11-2

ITEM 5-4

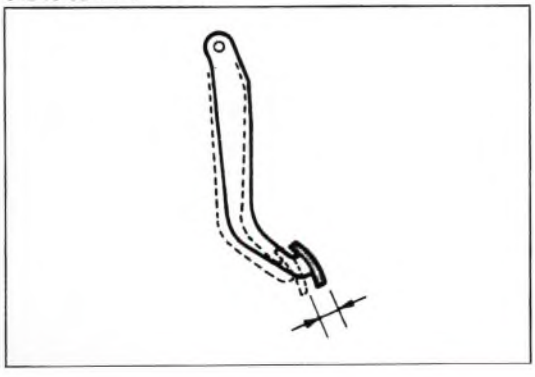
Brake Lever and Cable Inspection
Parking brake lever

- Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking lever.
- Check parking brake lever for proper operation and stroke, and adjust it if necessary.
 For checking and adjusting procedures, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT of SECTION 5.

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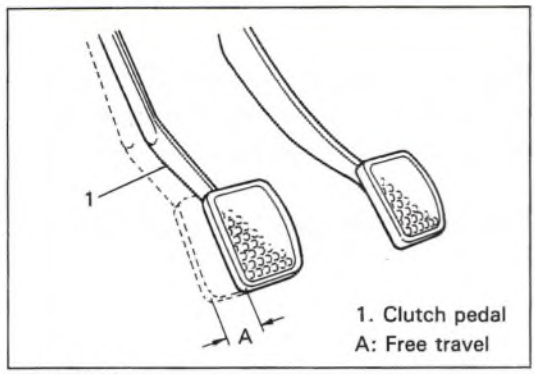
Parking brake cable
Inspect brake cable for damage and smooth movement. Replace cable if it is in deteriorated condition.

64B40-0B-11-4



ITEM 5-5

Brake Pedal Inspection
Check brake pedal travel.
For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.



64B40-0B-12-1

CHASSIS AND BODY

ITEM 6-1

Clutch Pedal Free Travel Inspection

Check clutch pedal free travel. Refer to SECTION 7C for procedure to check and adjust it.

ITEM 6-2

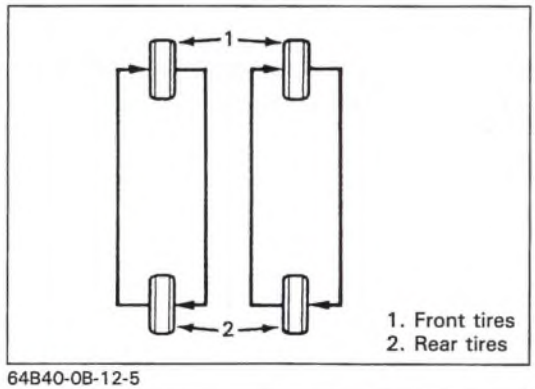
Tire and Wheel Disc Inspection

[Tire inspection]

- Check tire for uneven or excessive wear, or damage. If defective, replace.
- Check inflating pressure of each tire and adjust pressure to specification as necessary.

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with vehicle.**



64B40-0B-12-5

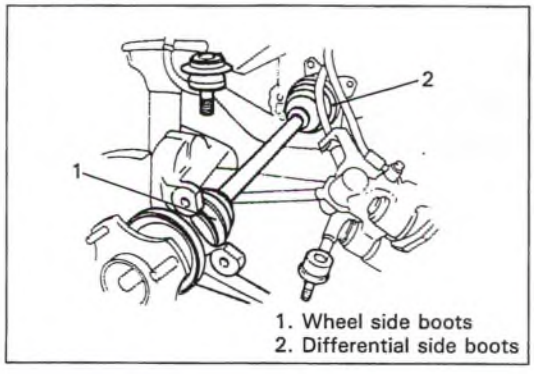
[Tire rotation]

Rotate tires.

For details of the steps, refer to SECTION 3F.

[Wheel disc inspection]

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

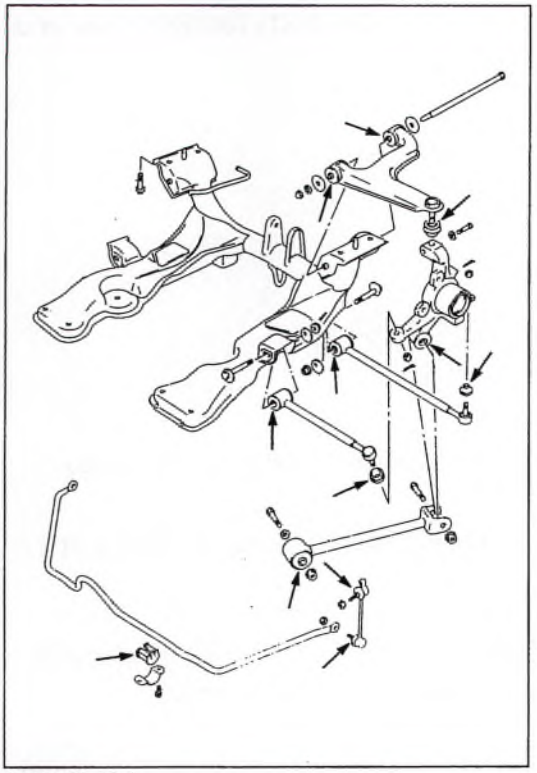


ITEM 6-3

Drive Axle Boot Inspection

Check drive axle boots (wheel side and differential side) for leakage, detachment, tear or any other damage.

Replace boot as necessary.

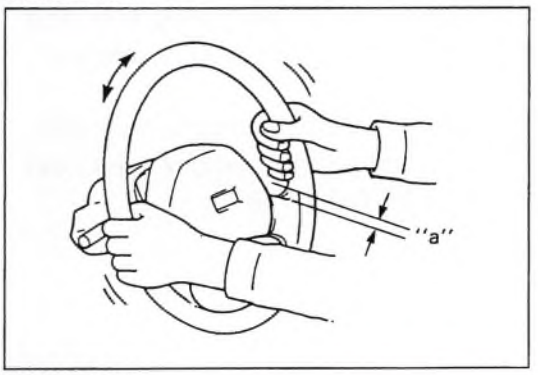


64B40-0B-13-4

ITEM 6-4

Suspension System Inspection

- Inspect front & rear shock absorbers for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration.
 Replace defective parts, it any.
- Check front wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to FRONT SUSPENSION INSPECTION of SECTION 3D.
- Check rear wheel bearing for wear damage abnormal noise or rattle. For details, refer to WHEEL BEARING INSPECTION of SECTION 3E.
- Check front and rear suspension systems for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication.
 Repair or replace defective parts, if any.
- Check suspension arm joint dust seals for leakage, detachment, tear or any other damage.
 Replace defective boot, if any.



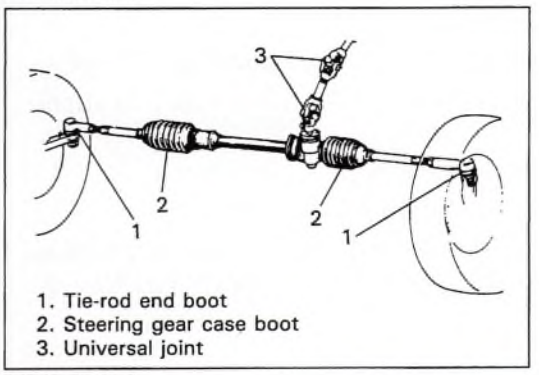
64B40-0B-13-5

ITEM 6-5

Steering System Inspection

1) Check steering wheel for play and rattle, holding vehicle straight on ground.

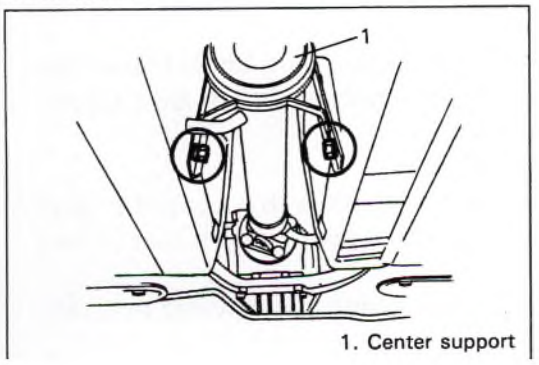
 Steering wheel play "a": 0—30 mm



1. Tie-rod end boot
2. Steering gear case boot
3. Universal joint

64B40-0B-14-1

2) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.
3) Check boots of steering linkage and steering gear case for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
4) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.

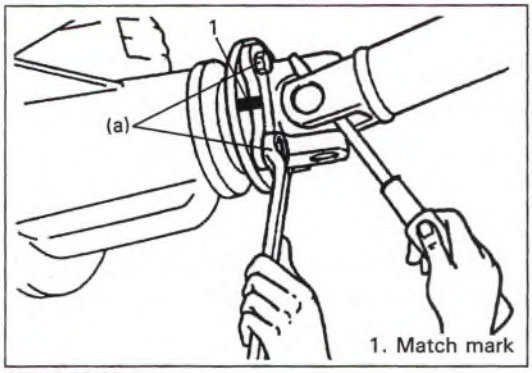


1. Center support

ITEM 6-6

Propeller Shafts Inspection

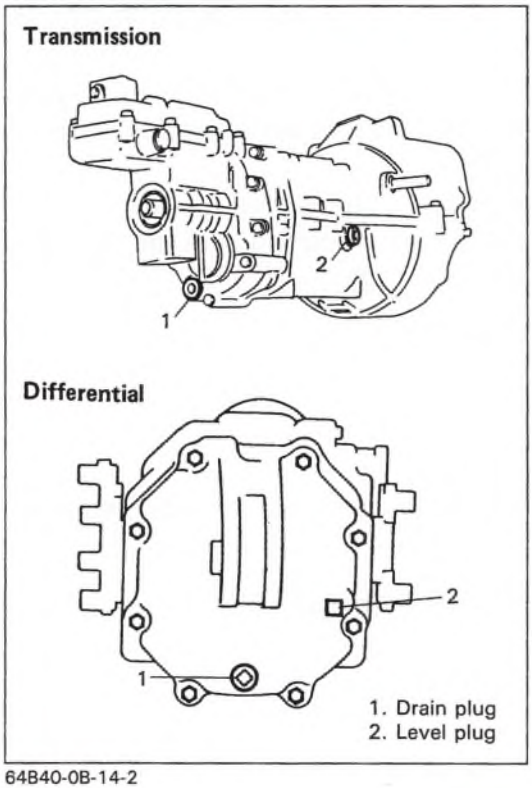
1) Check propeller shaft joints for wear, play and damage. If any defect is found, replace.
2) Check propeller shaft center support for biting of foreign matter, crack, abnormal noise and damage. If any defect is found, replace.



60A40-0B-23-2

3) Check propeller shaft flange yoke bolts for tightness, and retighten them as necessary.

Tightening Torque
(a): 18—28 N·m (1.8—2.8 kg-m)



64B40-0B-14-2

ITEM 6-7

Transmission Oil/Differential Oil Inspection and Change

[Inspection]

1) Inspect transmission/differential case for evidence of oil leakage.
 Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove level plug of transmission/differential.
4) Check oil level.
 Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
 If oil is found insufficient, pour specified oil up to level hole.
 For specified oil, refer to description of oil change under ON-VEHICLE SERVICE in SECTION 7A/7E.

[Change]

1) Place the vehicle level and drain oil by removing drain plug.
2) Apply sealant to drain plug and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
 For recommended oil, its amount and tightening torque data, refer to ON-VEHICLE SERVICE of SECTION 7A/7E.

64B40-0B-14-4

ITEM 6-8

Door Hinges, Gear Shift Control Lever and Shaft Inspection

Check that doors and gear shift control lever move smoothly without abnormal noise.
If defective, lubricate as follows.
Wipe off dirt of door hinges and apply a thin coat of engine oil. Open and close door several times to insure that oil has worked in effectively.
Lubricate lever seat and shaft bushings with water resistant chassis grease.

64B40-0B-15-2

FINAL INSPECTION

BODY PARTS OPERATION

Hood Latch

Check that hood opens and closes smoothly and properly. Also check that it locks securely when closed.

Doors

Check that each door opens and closes smoothly and locks securely when closed.

Seats

Check that seat slides smoothly and locks securely at any position. Also check that reclining mechanism of front seat back allows it to be locked at any angle.

ROAD TEST

Carry out road test in safe place.

> **WARNING:**
> **When carrying out following road tests, select a safe place where no man or no running vehicle is seen so as to prevent any accident.**

Engine Start

Check engine start for readiness.

Clutch

Check for the following.

- Clutch is completely released when depressing clutch pedal,
- No slipping clutch occurs when releasing pedal and accelerating,
- Clutch itself is free from any abnormal condition.

Gearshift Lever (Transmission)

Check gear shift lever for smooth shifting to all positions and for good performance of transmission in any position.

Brake

[Foot brake]
Check the following when depressing brake pedal while driving;

- that brake works properly,
- that it is free from noise,
- and that braking force is applied equally on all wheels.

[Parking brake]
Check to ensure that parking brake is fully effective when the vehicle is stopped on the slope and brake lever is pulled all the way.

Steering

- Check to ensure that steering wheel is free from instability, or abnormally heavy feeling while driving.
- Check that the vehicle does not wander or pull to one side.

Engine

- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.

Body, Wheels and Power Transmitting System

Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.

Meters and Gauge

Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

Lights

Check that all lights operate properly.

Seat Belt

Inspect belt system including webbing, buckles, latch plates, retractors and anchors.
Check that seat belt is securely locked.

> **WARNING:**
> **For this test, select a safe place without any running vehicle so as to prevent any accident. And again make sure that no man or no other vehicle is seen in front or behind and use great care to the surroundings when carrying out the test.**

OWNER INSPECTIONS AND SERVICES

Litsted below are items which should be checked and serviced by either the owner himself or a qualified technician daily or periodically to help ensure safety and dependability of each vehicle. Should any problem occur, contact nearby dealer or a qualified technician for proper service advice.
For the safety of the driver himself and others, be sure to inspect any safety-related parts that could have been damaged in any accident and take corrective measures for whatever in need of repair before using vehicle again.

BEFORE OPERATING YOUR VEHICLE

[OUTSIDE VEHICLE]

Fluid Leak Check
Check for fuel, coolant, oil or other fluid leakage by looking at surface beneath vehicle after it has been parked for a while. Water dripping from air conditioning system after use is normal. If gasoline fume of fluid is noted at any time, investigate its cause and correct it at once.

Door Operation
Check that all doors including back door operate smoothly, and that all doors close and all latches lock securely.

Tire, Wheel and Wheel Nut Inspection
- Check pressuer as shown on tire placard (including spare tire). Pressure should be checked when tires are ''cold''.
- Check tire for cuts, damage or excessive wear.
- Check wheel nuts for looseness of for missing nuts. If necessary, tighten them.

[INSIDE VEHICLE]

Seat Adjuster Operation
- Move seat back and forth and check that seat adjuster operates smoothly and locks properly and securely.
- Check that seat back can be reclined smoothly and locked securely at any angle.

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Warning Light, Buzzer and Tone Operation
Check all warning lights, buzzer and interior indicator lights for operation. For details, refer to Owner's Manual.

Glass, Mirror, Light and/or Reflector Condition
Check each glass, mirror, light and reflector for breakage, scratch, dirt or any other damage which could reduce driver's view or visibility or cause injury. Replace, clean or repair promptly, if necessary.

Rear View Mirror and Sun Visor Operation
Check that friction joints hold mirrors and sun visors in place.

Seat Belts Condition and Operation
Check belt system including webbing, buckles, latch plates, retractors, guide loops and anchors for proper operation, damage and/or wear.

Light Operation
check license plate lights, headlights, small lights, taill lights, brake lights, turn signals, back-up lights, instrument panel lights and interior lights, hazard warning flashers and other lights.
Have headlight aim checked at once if beams seem improperly aimed.

Clutch Pedal Free Travel Check
- Check free travel and adjust as necessary.
- Check pedal for smooth operation.

Accelerator Pedal Operation
Check that pedal operates smoothly without getting caught or interfered by and other part.

Exhaust System Check
Check for leakage, cracks or loose supports.

Brake Pedal Check
- Check pedal for smooth operation.
- Check pedal travel (pedal-to-wall clearance). For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.
- Check brake booster function.

Parking Brake Lever Travel Check
Check that lever has proper travel.

[UNDER HOOD]

Engine Hood Latch Operation
Check that hood closes firmly. Check for damaged, loose or missing parts that might prevent tight latching. Make sure secondary latch keeps hood from opening all the way when primary latch is released.

Engine Oil Level Check
Check engine oil on the dipstick with the engine turned off and add if necessary.
See your Owner's Manual.

NOTE:
A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Engine Coolant Level and Condition
When engine is cool, check coolant level in reservoir tank and add if necessary.
Inspect coolant and replace if dirty or rusty.
A normal coolant level should be between "FULL" and "LOW" marks on reservoir tank.
See Owner's Manual.

NOTE:
A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Windshield Washer Fluid Level Check
Check washer fluid level in tank and add if necessary.

Brake Master Cylinder Fluid Level Check
Check reservoir tank fluid level in accordance with Owner's Manual and keep at proper level.

NOTE:
A large loss in this system may indicate a problem. Have it inspected and repaired at once.

Battery Electrolyte Level Check
Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case.

Engine Drive Belt(s) Inspection
Inspect all belts for cracks, fraying and wear. Adjust or replace as needed.

64B40-0B-18-1

WHILE OPERATING YOUR VEHICLE

Horn Operation
Check to make sure that horn works when its button is pushed at its any part.

Windshield Wiper and Washer Operation
Check wipers and washer for proper operation. Also check spray direction of washer fluid.
Check wiper blades for wear or cracks whenever they fail to wipe clean. If necessary, replace.

Windshield Defroster
Periodically check that air comes out from defroster outlet when operating heater or air conditioner.
Set fan switch lever to "HI" position for this check.

Steering System Operation
Be alert for any changes in steering action. An inspection or service is needed when: the steering wheel is harder to turn or has too much free play, or if there are strange sounds when turning.

Brake System Operation
Be alert to abnormal noise, increase in brake pedal travel or repeated pull to one side when braking.
When any of such conditions is noted, check brake system. If brake warning light stays on or keeps flashing, there may be some trouble in brake system.
Also, test parking brake by pulling parking brake lever.

Exhaust System Operation
Be alert for any changes in the sound of the exhaust system or any smell of fumes. These are signs the system may be leaking or overheating. Have it check and/or repaired at once.

Tire and Wheel Operation
Be alert to vibration of the steering wheel or seat at normal highway speeds. This may mean a wheel balance is needed. Also, a pull right or left on a straight, level road may shown the need for a tire pressure adjustment or wheel alignement.

IT IS RECOMMENDED TO CHECK FOLLOWING ITEMS AT LEAST ONCE A YEAR

Under Body Flushing

At least once a year in spring, flush underbody with water to remove corrosive deposits such as road salt and dirt. Use special care to clean any area where mud and dust can collect easily. Take out dust packed in closed place before flushing.

Engine Cooling System

Check coolant and its unti-freeze property. If it is contaminated or rusty, drain, flush with water and refill new coolant. Maintain coolant at such mixture ratio as specified in Owner's Manual, thereby freezing and corrosion is avoided and engine operating temperature is properly controlled. Check hoses and replace if cracked, swollen hardened or otherwise deteriorated. Tighten hose clamps. Clean outside of radiator and air conditioning condensor. Wash radiator filler cap and neck.

For coolant change interval, refer to Maintenance Schedule Table.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SF, SG or SH, SAE 10W-30 (Refer to page 0B-4)
Engine coolant	Ethylene-glycol base coolant ("Antifreeze/Anticorrosion coolant")
Brake fluid	See brake reservoir tank cap
Manual transmission oil	API GL-4 SAE 75W-90
Differential oil	Hypoid gear oil API GL-5 SAE 80W-90
Gear shift control lever and shaft	Water resistant chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil
Hood latch assembly	Engine oil
Key lock cylinder	Spray lubricant

64B40-0B-20-1

SECTION 1A

HEATER AND VENTILATION

1A

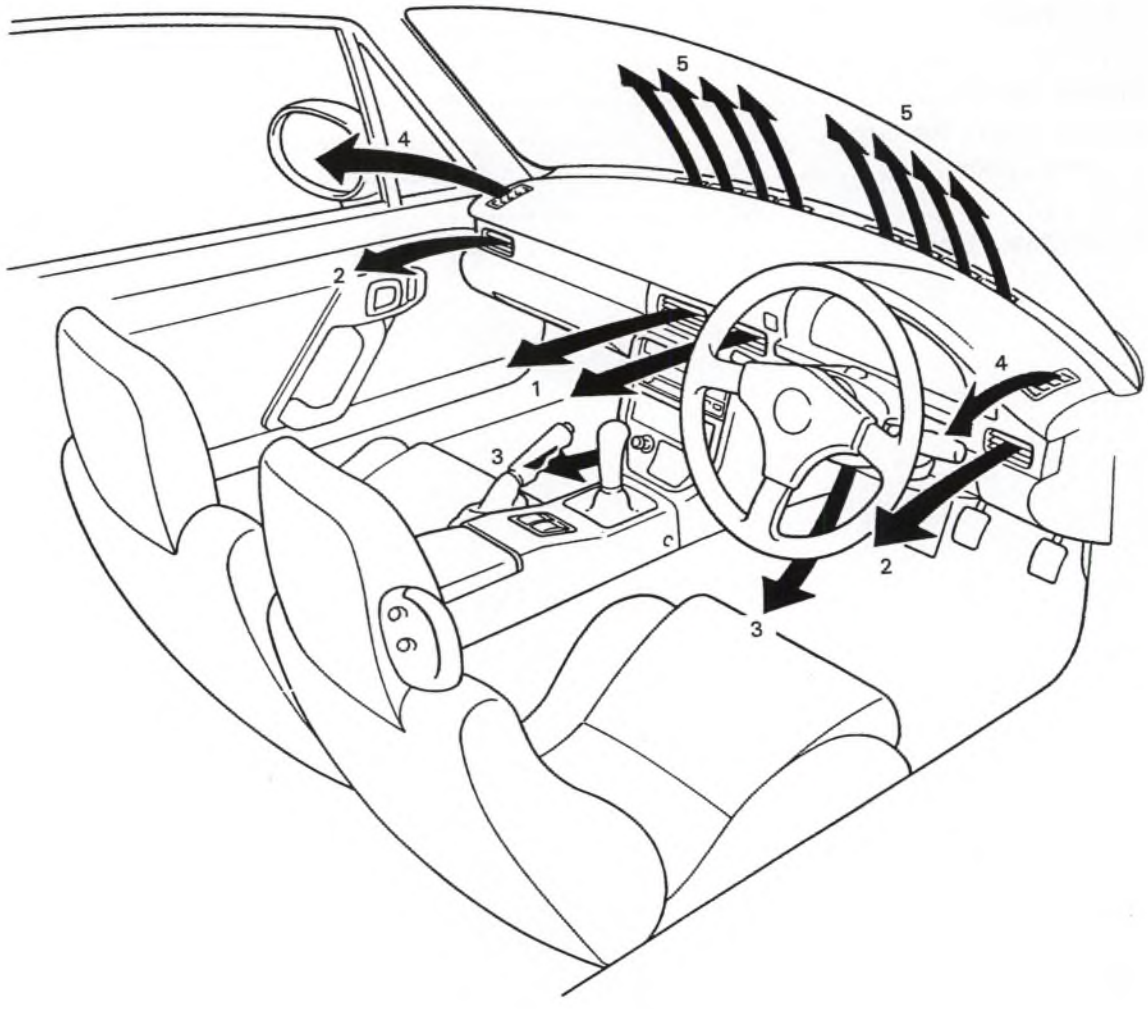
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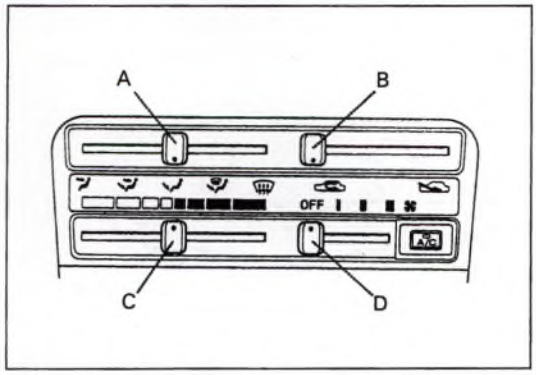
GENERAL DESCRIPTION

HEATER

The heater and ventilation of this vehicle consist of such main components as control levers, blower motor, heater core and air ducts. The blower motor runs on electricity to send air inside. In the heater core, the cooling water warmed by the engine keeps circulating. Each control lever controls the blower motor speed, temperature and operation of the dampers in the air ducts so that the air is delivered where necessary.

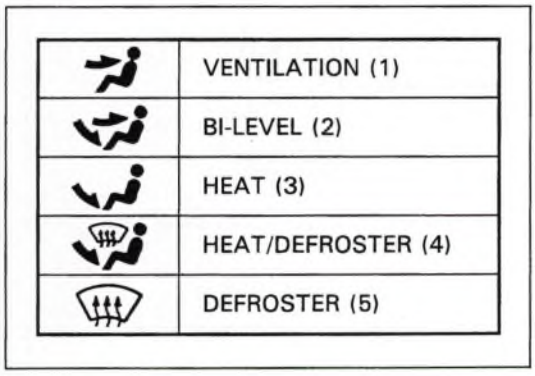


1. Center outlet
2. Side outlet
3. Floor outlet
4. Side demister
5. Defroster



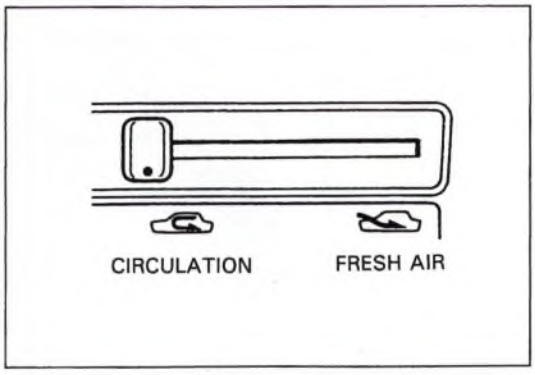
HEATER CONTROL OPERATION

A : Air control lever
B : Fresh air control lever
C : Temperature control lever
D : Blower motor speed selection lever

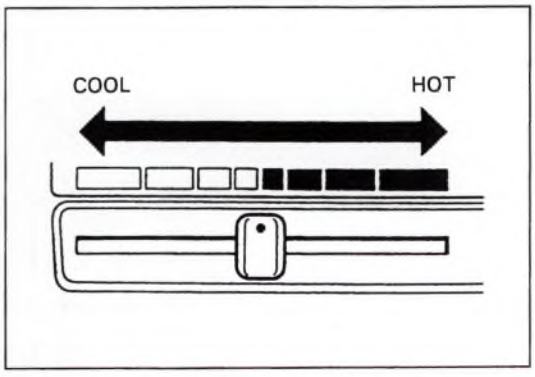


A : Air control lever

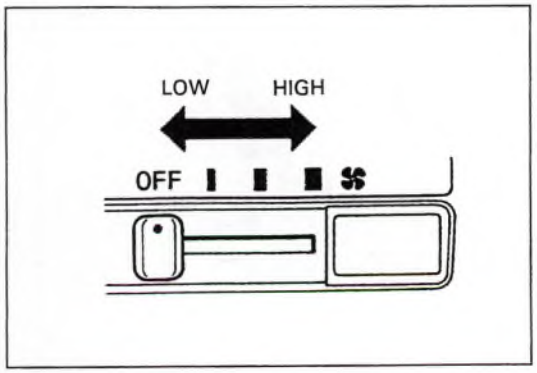
(1) Air flows from center and side outlets.
(2) Air flows from center, side and floor outlets.
(3) Air flows from floor outlets.
(4) Air flows from floor outlet, front defroster and side demister outlets.
(5) Air flows from front defroster and side demister outlet.



B : Fresh air control lever

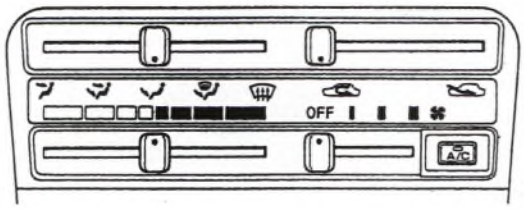


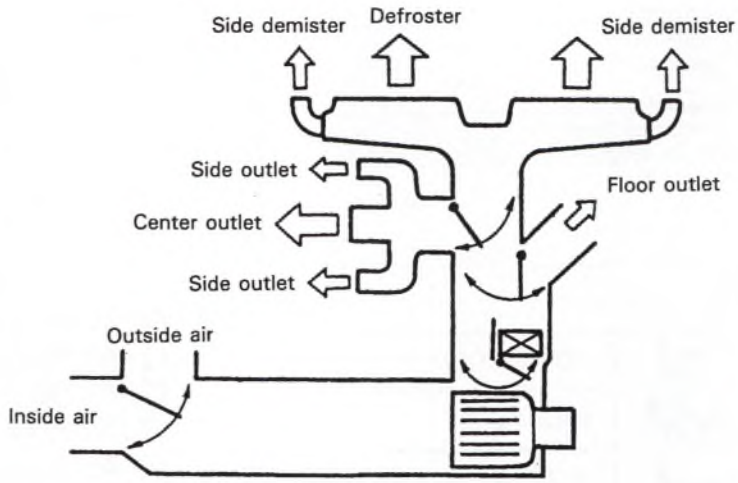
C : Temperature control lever



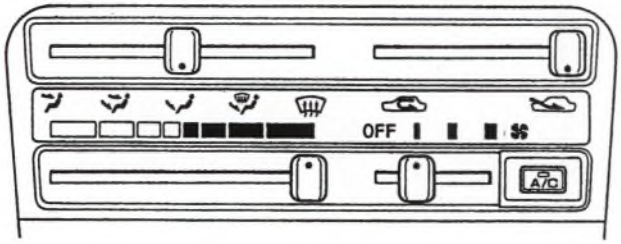
D : Blower motor speed selection lever

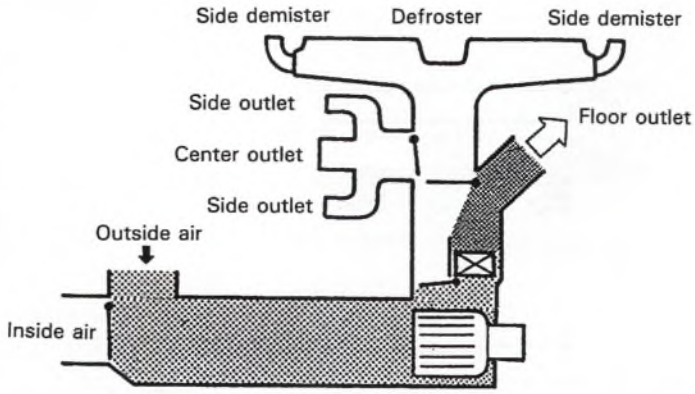
VENTILATION



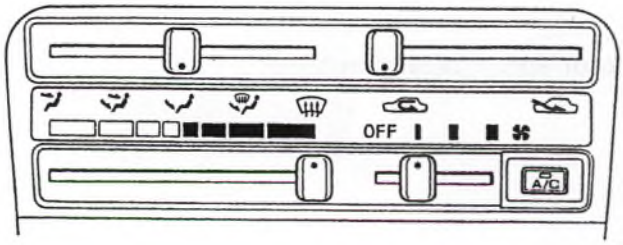


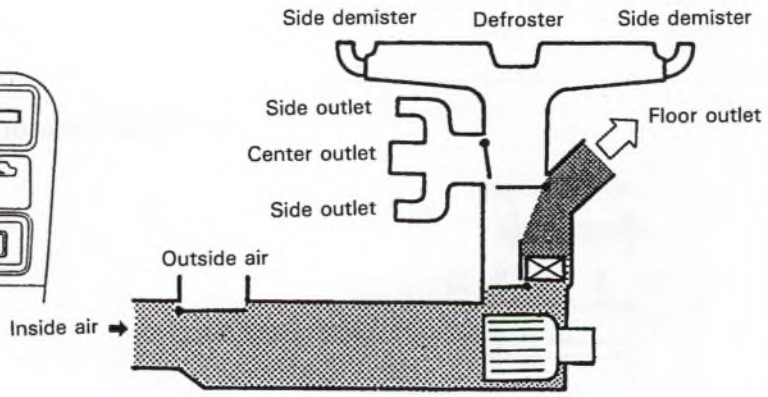
OUTSIDE AIR-INTRODUCED HEATING



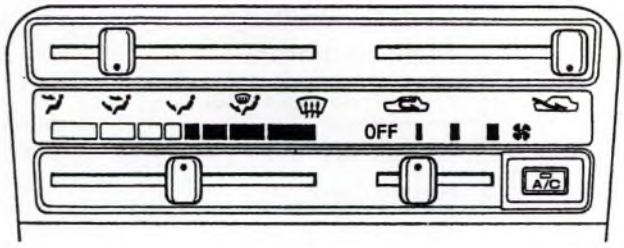


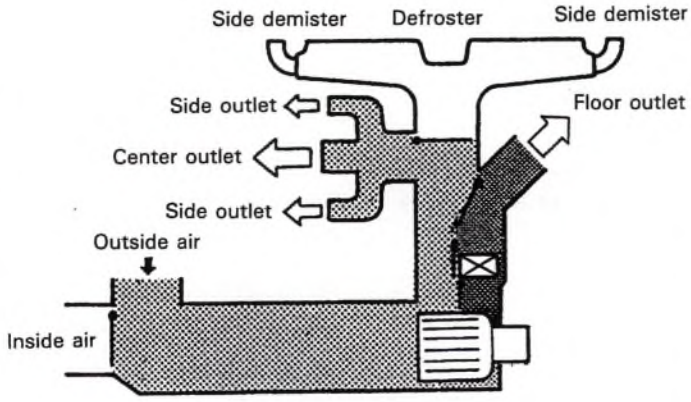
INSIDE AIR-CIRCULATED HEATING





HEAD-COOLED/FEET-WARMED HEATING



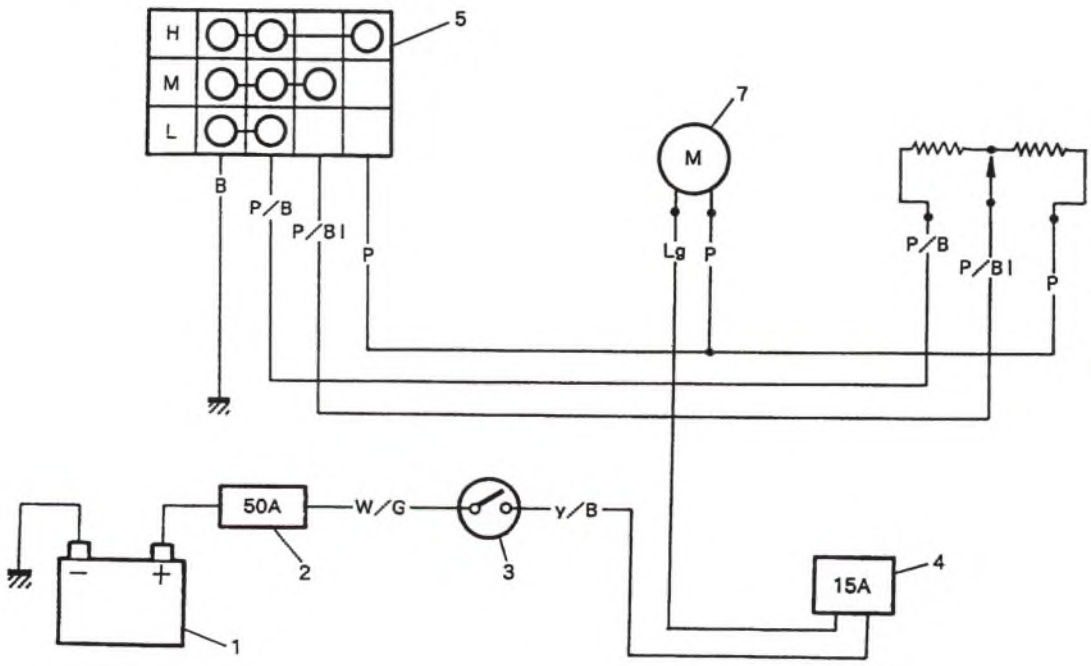


DIAGNOSIS

Trouble	Possible cause	Remedy
Heater blower won't work even when its switch is ON.	Blower fuse blown	Replace fuse to check for short.
	Blower register faulty	Check continuity.
	Blower motor faulty	Replace motor.
	Wiring or grounding faulty	Repair as necessary.
Incorrect temperature outlet	Control cables broken or binding	Check cables.
	Air damper broken	Repair damper.
	Air ducts clogged	Repair air ducts.
	Heater radiator leaking or clogged	Replace radiator.
	Heater hoses leaking or clogged	Replace hoses.

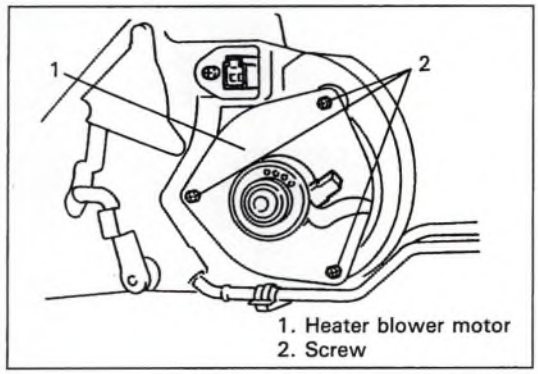
ON-VEHICLE SERVICE

WIRING CIRCUIT



1. Battery
2. Main fuse
3. Main switch
4. Fuse box
5. Heater blower switch
6. Heater resistor
7. Blower motor

B : Black
Lg : Light green
P : Pink
P/B : Pink/Black
P/Bl : Pink/Blue
W/G : White/Green
Y/B : Yellow/Black



1. Heater blower motor
2. Screw

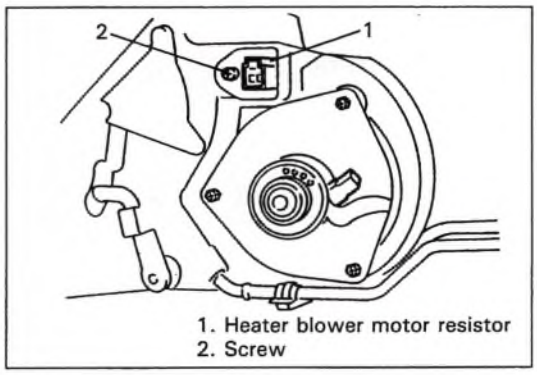
HEATER BLOWER MOTOR

REMOVAL

1) Disconnect battery (−) cable at battery.
2) Disconnect blower motor lead-wire at coupler.
3) Remove blower motor.

INSTALLATION

Reverse removal procedure for installation.

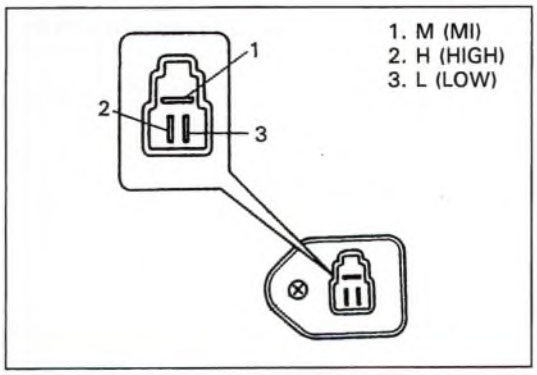


1. Heater blower motor resistor
2. Screw

HEATER BLOWER MOTOR RESISTOR

REMOVAL

1) Disconnect battery (−) cable at battery.
2) Disconnect blower motor resistor lead wire at coupler.
3) Remove heater blower motor resistor.



1. M (MI)
2. H (HIGH)
3. L (LOW)

INSPECTION

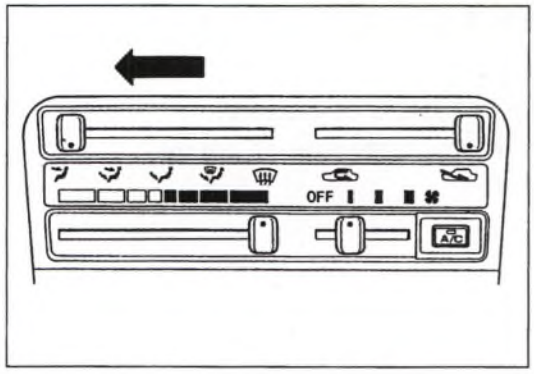
Measure the resistor for each terminal-to-terminal resistance.

Terminal-to-terminal	Resistance (Ω)
H—M	1.09
H—L	3.95
M—L	2.86

If the measured resistor is incorrect, replace the heater blower resistor.

INSTALLATION

Reverse removal procedure for installation.

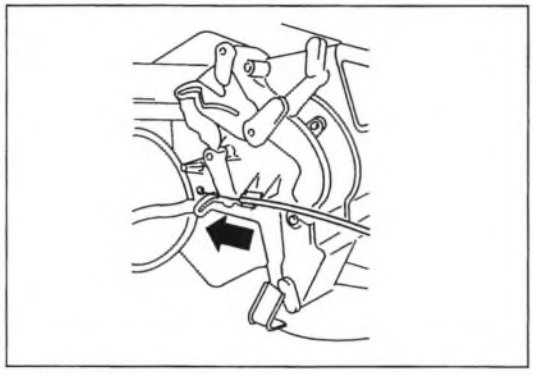


HEATER CONTROL CABLE

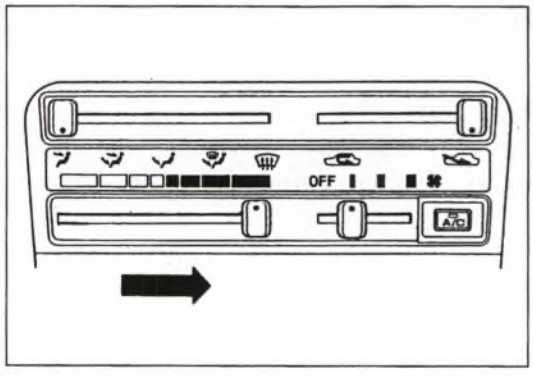
ADJUSTMENT

Air control cable

1) Set control lever to ventilation position.

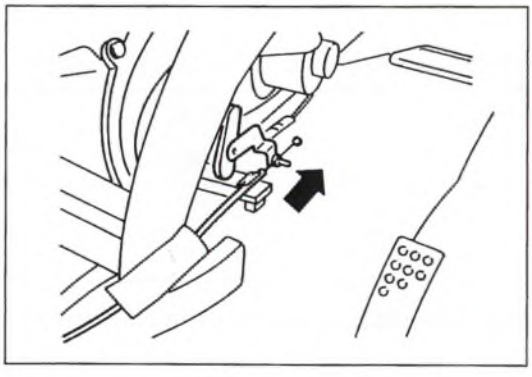


2) Push lever and link in arrow directions fully as shown in figure and fix cable there.

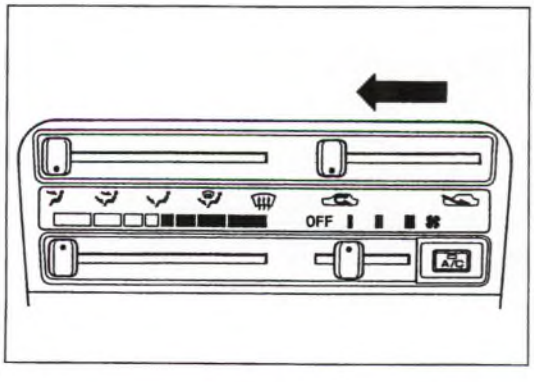


Temperature control cable

1) Set control lever to "HOT" position.

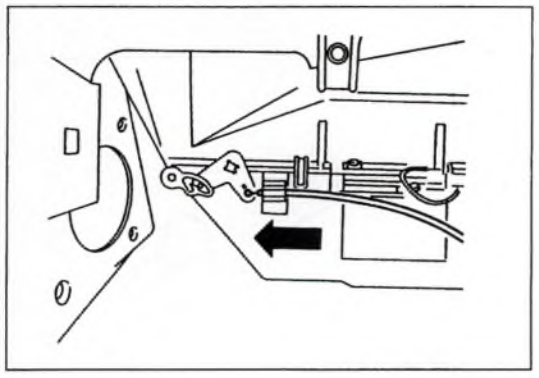


2) Push lever and link in arrow direction fully as shown in figure and fix cable there.



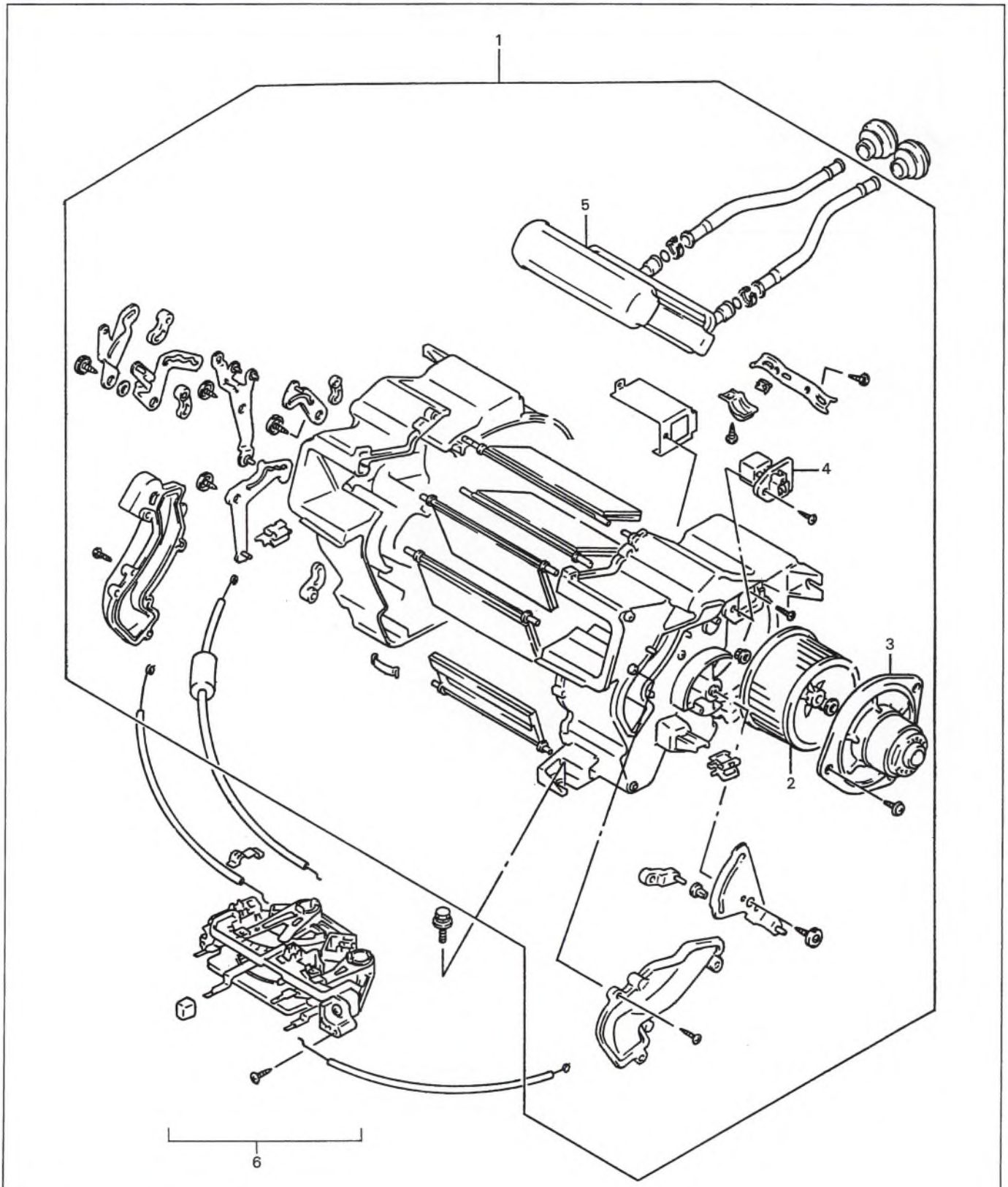
Fresh air control cable

1) Set control lever to "CIRCULATION" position.

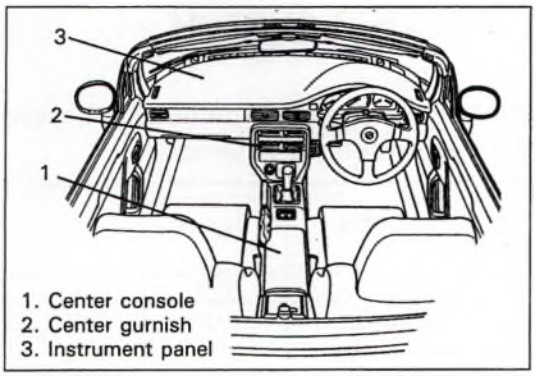


2) Push lever in arrow direction fully as shown in figure and fix cable there.

HEATER UNIT

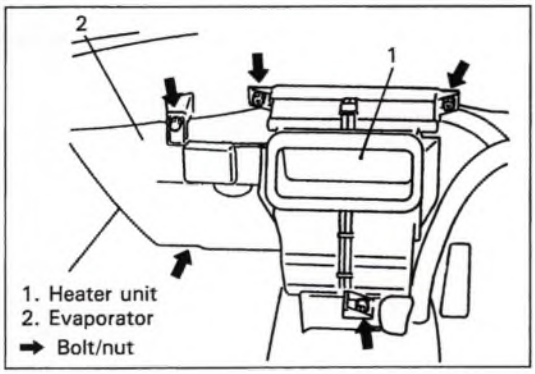


1. Heater assembly
2. Blower fan
3. Fan motor
4. Heater blower resistor
5. Heater core
6. Heater control lever assembly

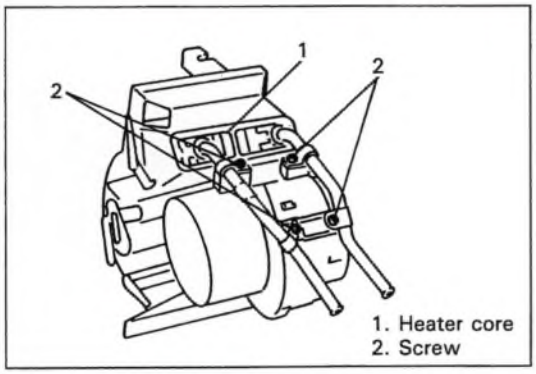


REMOVAL

1) Disconnect battery (−) cable, drain coolant and disconnect 2 water hoses from heater unit.
2) Remove instrument panel and related parts.
3) Disconnect wiring harness couplers.



4) Remove heater case and evaporator mounting bolts and nuts.
5) Remove evaporator.
6) Remove heater unit.



7) Remove mounting screw and remove heater core.

INSTALLATION

Install heater unit by reversing removal procedure, noting the following items.

1) Adjust control cables.
2) Fill coolant to radiator.

HEATER BLOWER MOTOR SWITCH

INSPECTION

Check switch for each terminal to terminal continuity, if there is no continuity, replace control lever assembly.

Terminal / Switch position	B	P/B	P/Bl	P
High	○——	——○	——	——○
Middle	○——	——○	——○	
Low	○——	——○		

B : Black
P : Pink
P/B : Pink/Black
P/Bl: Pink/Blue

SECTION 1B

AIR CONDITIONING

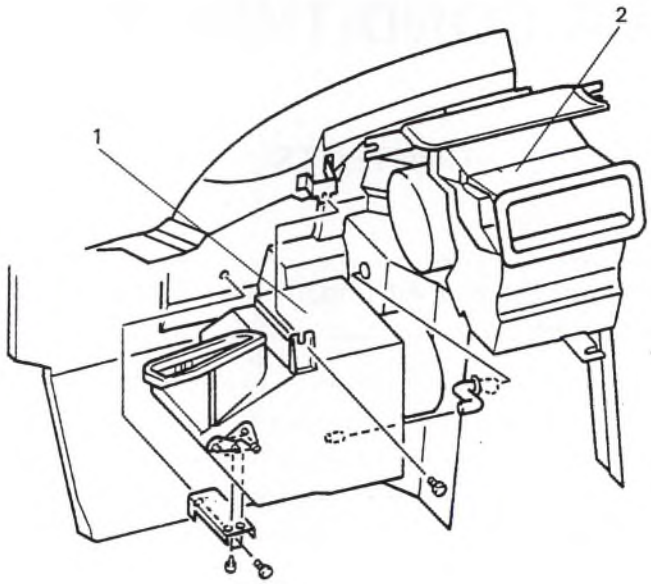
1B

CONTENTS

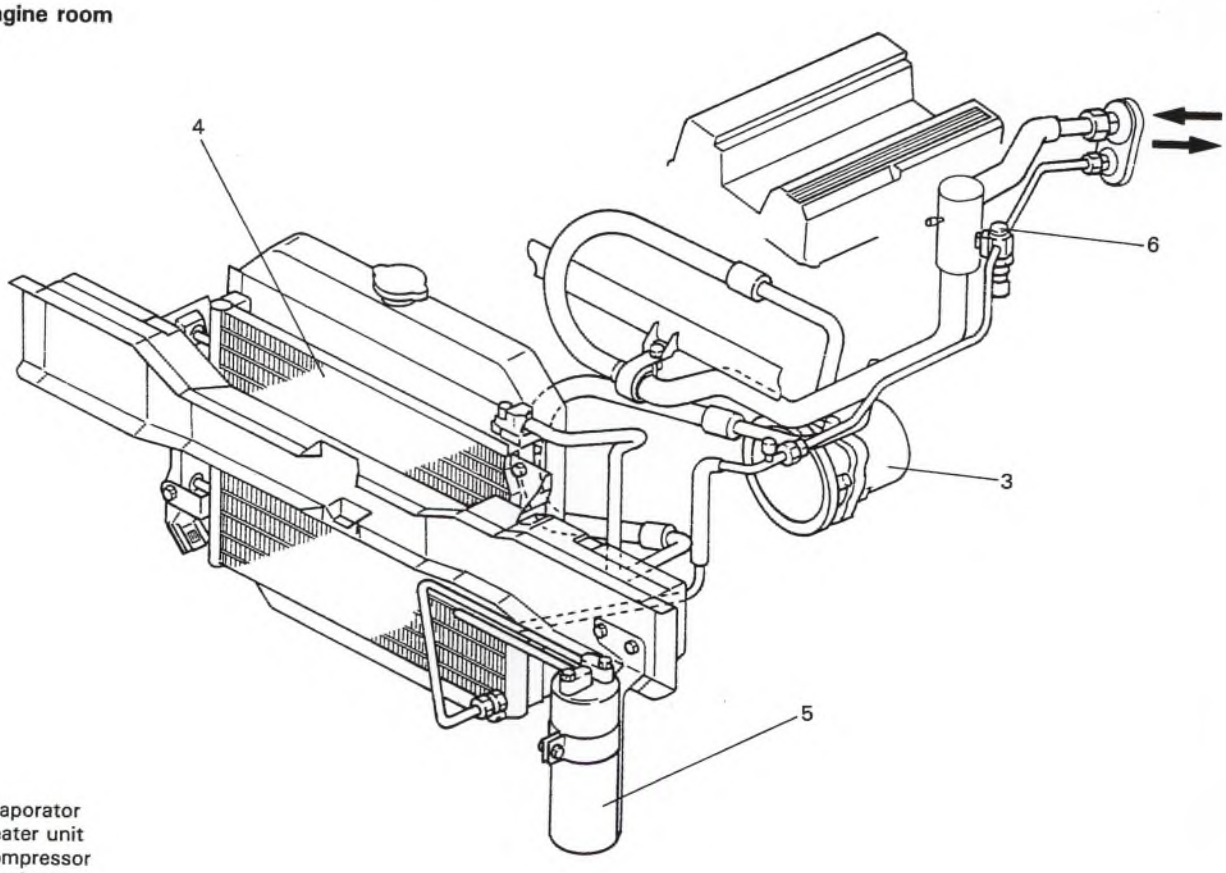
GENERAL DESCRIPTION 1B- 2
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GENERAL DESCRIPTION

In cabin

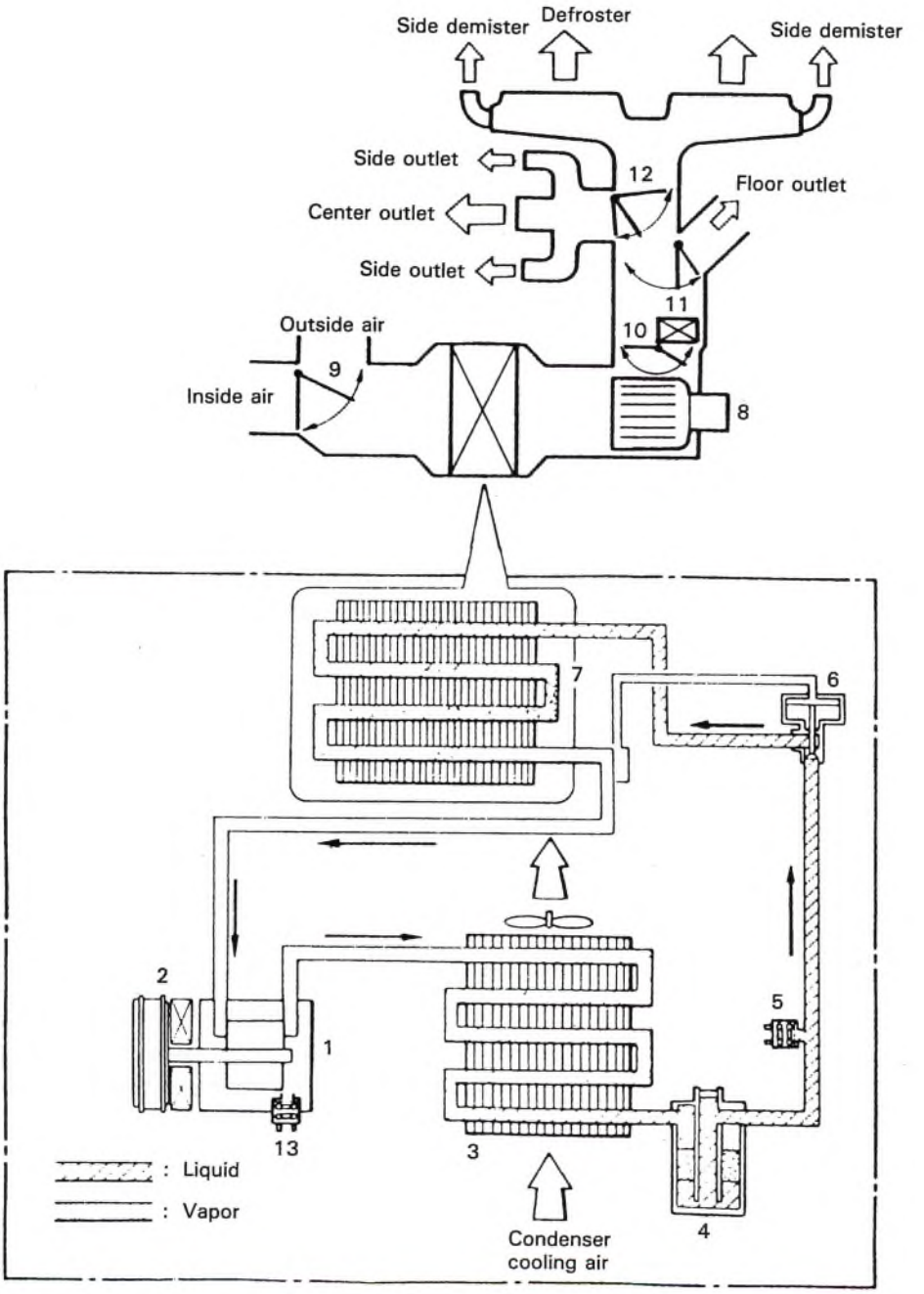


In engine room



1. Evaporator
2. Heater unit
3. Compressor
4. Condenser
5. Receiver/dryer
6. Sight glass

MAJOR COMPONENTS AND REFRIGERANT FLOW OF AIR CONDITIONING SYSTEM

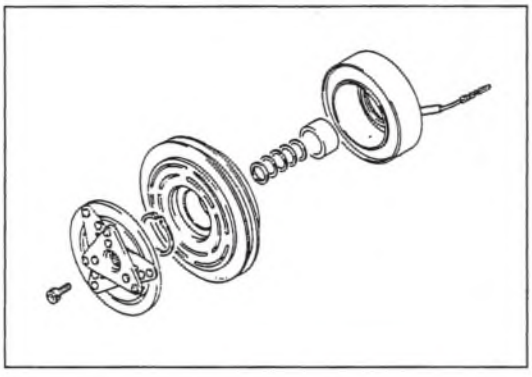


1. Compressor
2. Magnet clutch
3. Condenser
4. Receiver/dryer
5. Dual pressure switch
6. Expansion valve
7. Evaporator
8. Blower motor
9. Air control damper
10. Temp. control damper
11. Heater core
12. Mode control damper
13. Compressor thermal switch

FUNCTION OF EACH CONTROL COMPONENT

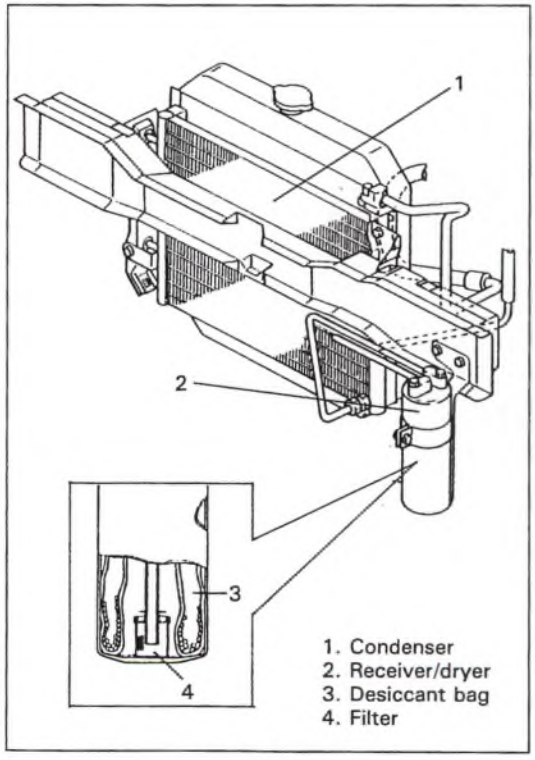
COMPRESSOR

The compressor performs two main functions.
It compresses the low pressure refrigerant vapor from the evaporator into a high pressure, high temperature vapor. Also, the compressor pumps refrigerant and refrigerant oil through the A/C system.



MAGNETIC CLUTCH

A device used, with the engine running, for operating the air conditioner only when needed. It is controlled by the A/C switch, thermoswitch and dual pressure switch.



1. Condenser
2. Receiver/dryer
3. Desiccant bag
4. Filter

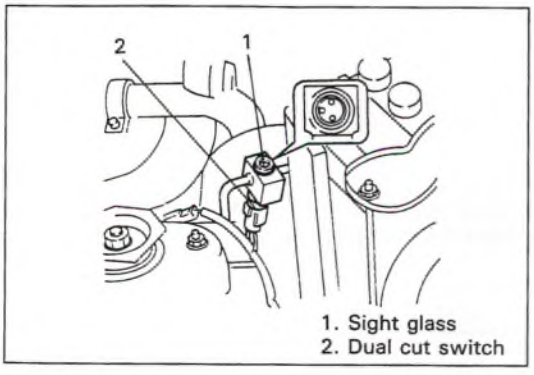
CONDENSER

The condenser assembly in front of the radiator is made up of coils which carry the refrigerant, and cooling fins to provide rapid transfer of heat. The air passing through the condenser cools the high pressure refrigerant vapor causing it to condense into a liquid.

RECEIVER/DRYER

The receiver/dryer performs two functions as shown below:

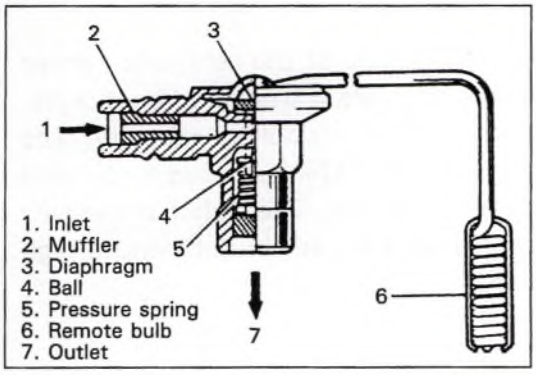
A. The receiver serves as a temporary storage container for condensed-liquid refrigerant so that it is possible to supply the evaporator with the condensed-liquid refrigerant, conforming to the demand of the cooling load.
B. The dryer serves to remove the dirt and water mixed in the cycling refrigerant by means of the filter and desiccant bag.



1. Sight glass
2. Dual cut switch

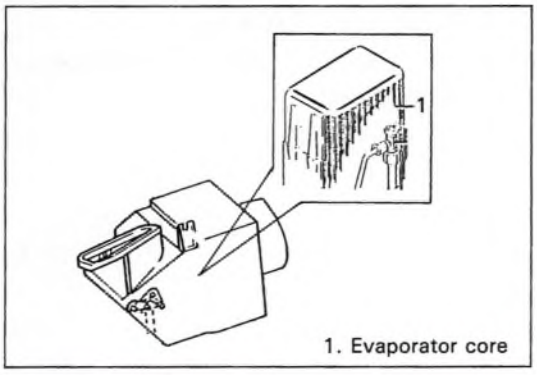
SIGHT GLASS

The sight glass, installed to the receiver/dryer outlet pipe, serves to show the flowing state of the refrigerant.



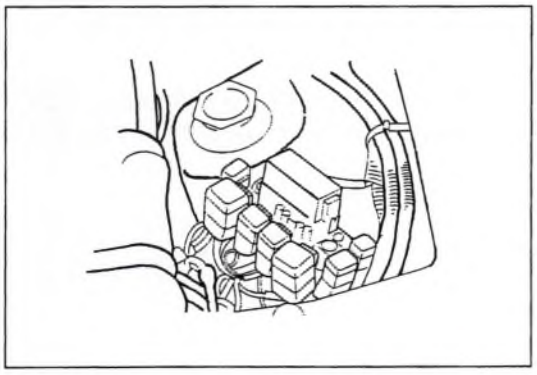
EXPANSION VALVE

When the valve is connected in the system, high pressure liquid refrigerant enters the valve through the screen from the receiver-dehydrator or condenser and passes through the seat and orifice. Upon passing through the orifice the high pressure liquid becomes low pressure liquid. The low pressure liquid leaves the valve and flows into the evaporator core where it absorbs heat from the evaporator core and changes to a low pressure vapor, and leaves the evaporator core as such.



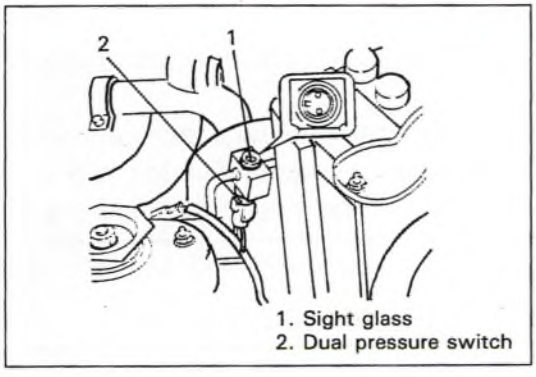
EVAPORATOR

The evaporator is a device which cools and dehumidifies the air before it enters the vehicles. High pressure liquid refrigerant flows through the expansion valve into the low pressure area of the evaporator. The heat in the air passing through the evaporator core is lost to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water.



RELAY (radiator fan)

A relay to operate the radiator fan motor. The motor continues operation as long as the air conditioner (compressor) is under operation.



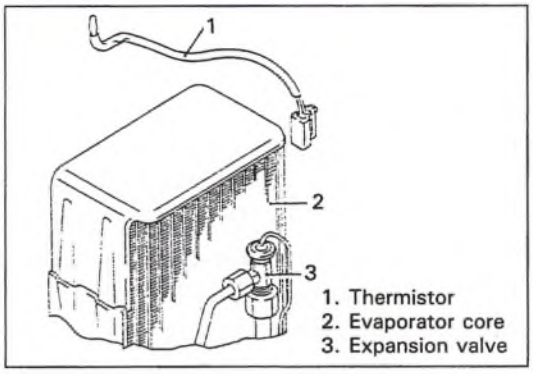
DUAL PRESSURE SWITCH

A control switch to stop the compressor operation when the pressure of cycling refrigerant has reached exceedingly low level due to underfilled refrigerant or exceedingly high level due to overfilled refrigerant.

THERMAL SWITCH (COMPRESSOR OUTLET GAS SWITCH)

A switch to stop compressor operation when the compressor outlet gas (refrigerant) temperature exceeds 150° and to restart operation when the gas temperature drops to 130°C.

The switch is installed on compressor.



1. Thermistor
2. Evaporator core
3. Expansion valve

EVAPORATOR THERMISTOR

When the evaporative temperature of the refrigerant drops to 0°C or below, the evaporator fins will develop frost or ice, reducing the airflow, lowering the cooling capacity. The evaporator thermistor is a switch which is used to prevent this frosting or icing of the evaporator. The switch is installed on the evaporator, employing a sensor bulb having a high coefficient of expansion.

COOLANT (WATER) TEMPERATURE GAUGE

When the coolant temperature exceeds 110°C on this gauge, the compressor operation is stopped.

ACCELERATION OFF SWITCH (ACCELERATOR PEDAL SWITCH)

A switch to stop compressor operation for 10 seconds when the accelerator pedal is depressed more than 90% of its full stroke down.

ENGINE SPEED (IGNITION SIGNAL)

The engine speed is detected by the A/C amplifier (controller) through ignition signals.
When it reaches higher or lower than below specifications, A/C amplifier turns OFF compressor magnetic clutch to protect the compressor or to prevent the engine from stalling.

Engine speed when magnetic clutch is OFF	Below 600 r/min.
	Above 6,900 r/min.

IDLE-UP SYSTEM

It increases the engine idle speed to prevent the engine from stalling when the air conditioning is operating (i.e. when A/C switch and magnetic clutch are ON).

DIAGNOSIS

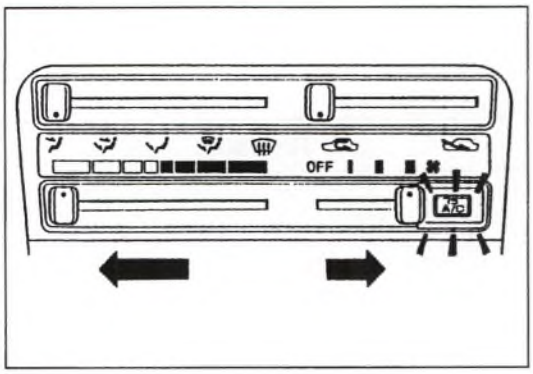
TROUBLE DIAGNOSIS

Trouble	Possible cause	Remedy
No cooling or warm air.	Magnetic clutch does not engage properly	
	a) Fuse blown	Replace fuse and check for short.
	b) Magnetic clutch faulty	Check clutch.
	c) A/C switch faulty	Check switch.
	d) Thermister faulty	Check thermister.
	e) Dual pressure switch faulty	Check switch.
	f) Wiring or grounding faulty	Repair as necessary.
	g) No refrigerant	Check A/C circuit.
	h) A/C amplifier faulty	Replace A/C amplifier.
	Compressor is not rotating properly	
	a) Drive belt loose or broken	Tighten or replace drive belt.
	b) Compressor faulty	Check compressor.
	Blower inoperative	Check blower.
	Expansion valve faulty	Check expansion valve.
	Leak in system	Check system for leaks.
	Receiver/dryer having blown fusible plug or clogged screw	Check receiver/dryer.
Cool air comes out only intermittently.	Magnetic clutch slipping	Check magnetic clutch.
	A/C amplifier faulty	Replace A/C amplifier.
	Expansion valve faulty	Check expansion valve.
	Wiring connection faulty	Repair as necessary.
	Excessive moisture in system	Evacuate and charge system.
Cool air comes out only at high speeds.	Condenser clogged	Check condenser.
	Drive belt slipping	Check or replace drive belt.
	Compressor faulty	Check compressor.
	Insufficient or excessive charge of refrigerant	Check charge of refrigerant.
	Air in system	Evacuate and charge system.
Insufficient cooling.	Condenser clogged	Check condenser.
	Drive belt slipping	Check or replace drive belt.
	Magnetic clutch faulty	Check magnetic clutch.
	Compressor faulty	Check compressor.
	Expansion valve faulty	Check expansion valve.
	Thermister faulty	Check thermister.
	Insufficient or excessive charge of refrigerant	Check charge of refrigerant.
	Air or excessive compressor oil existing in system	Evacuate and charge system.
	Receiver/dryer clogged	Check receiver/dryer.
Insufficient velocity of cooled air	Evaporator clogged or frosted	Check evaporator.
	Air leaking from cooling unit or air duct	Repair as necessary.
	Air inlet blocked	Repair as necessary.
	Blower motor faulty	Replace blower motor.

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NOTE:

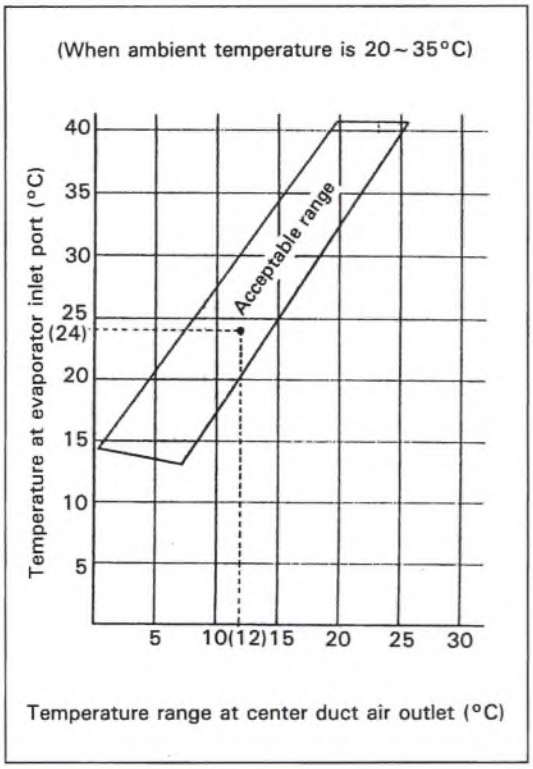
- **Chattering of vanes may be heard from compressor immediately after cooling started, but this doesn't mean anything abnormal. (This tends to occur after charging refrigerant or when ambient temperature is low.)**
- **Sight glass of receiver drier may sometimes look cloudy but this is no abnormal sign. This must not be taken as foaming when charging refrigerant.**



A/C PERFORMANCE TEST

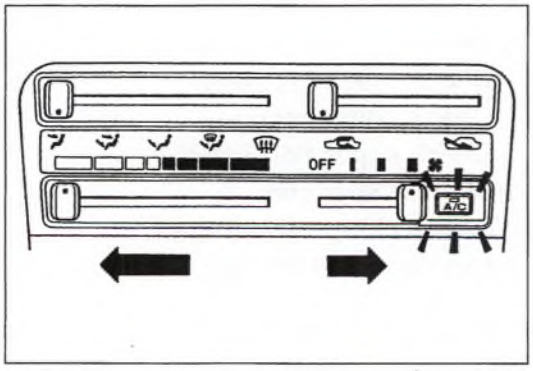
1) Prepare for performance test as follows.

 A/C switch: ON
 Fan switch: MAX
 Temperature control lever: COOL



2) Insert at dry bulb thermometers in center duct air outlet and evaporator inlet port, and measure each temperature.
3) Check inlet port temperature-to-outlet port temperature relationship using graph at the left.

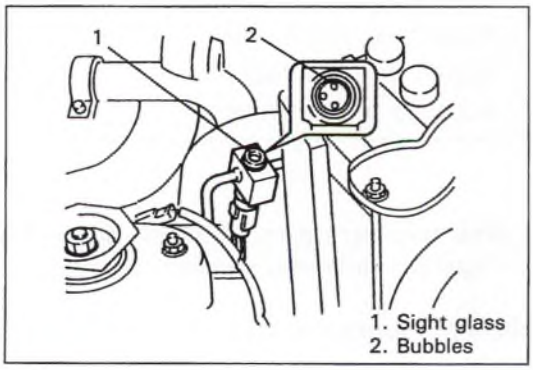
 For example, if evaporator inlet port temperature is 24°C and center duct air outlet temperature is 12°C, their crossing point is within acceptable range as shown in graph at the left.
 In this case, cooling performance is satisfactory and proper.
4) If cooling is not efficient enough, check charged state of refrigerant through sight glass of receiver dryer and perform pressure test using manifold gauge.



INSPECTION OF CHARGED STATE

The following procedure can be used for quickly checking whether the A/C system has a proper charge of refrigerant or not.

1) Run engine as fast idle, and operate air conditioning at its max. cooling capacity for a few minutes.



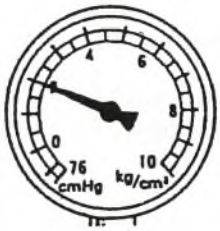
2) Look at the sight glass on receiver/dryer outlet pipe No.2 to check charged state of refrigerant.

Use the following table when checking charged state of refrigerant and correct it as necessary.

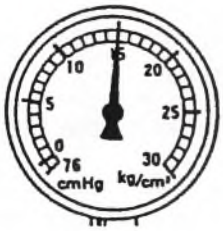
Item No.	Symptom	Charge of refrigerant	Remedy
1	Bubbles observed in sight glass	Insufficient charge of refrigerant in system	Check system for leaks with a leak tester.
2	No bubbles observed in sight glass	No or insufficient charge of refrigerant in system	Refer to the Items 3 and 4.
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty system	Evacuate and charge system and then check it for leaks with a leak tester.
4	Noticeable temperature difference between compressor inlet and outlet	Proper or too much charge of refrigerant in system	Refer to the Items 5 and 6.
5	When air conditioning is turned OFF, refrigerant in sight glass clears immediately and remains clear	Too much charge of refrigerant in system	Discharge excess charge of refrigerant to adjust it to a specified charge.
6	When air conditioning is turned OFF, refrigerant in sight glass once produces bubbles and then clears	Proper charge of refrigerant in system	NO CORRECTION NEEDED BECAUSE CHARGE OF REFRIGERANT IS NORMAL.

When normal

Low-pressure side
2 kg/cm²



High-pressure side
15 kg/cm²



TROUBLESHOOTING USING GAUGE MANIFOLD

When the refrigerant cycle is operating normally, the pressure values indicated at the gauge manifold are about 1.5 to 2.0 kg/cm² on the low-pressure side and about 14.5 to 15.0 kg/cm² on the high-pressure side under following conditions.

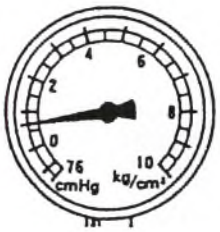
- Temperature at outlet of air conditioner: 25°C to 35°C
- Idle-up speed : 1050 rpm
- Fan switch : Max.
- Hot-Cool control lever : COOL
- Ambient temperature : about 30°C

NOTE:

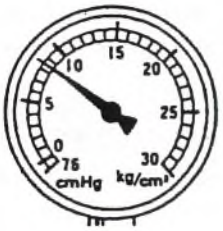
Following trouble diagnosis is based on above conditions.

When refrigerant is insufficient

Low-pressure side
0.8 kg/cm²



High-pressure side
8 ~ 9 kg/cm²



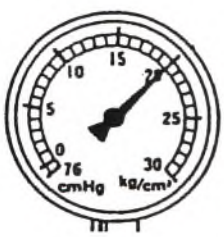
Symptom	Possible cause	Correction
• Both low and high-pressure side pressures are too low. • Bubbles are seen through sight glass. • Air from outlet is slightly cool.	• Gas leakage exists in system.	• Investigate leaky point and repair. • Replenish refrigerant.

When refrigerant is overcharged, condenser cooling is insufficient

Low-pressure side
2.5 kg/cm²



High-pressure side
20 kg/cm²



Symptom	Possible cause	Correction
• Both low and high-pressure side pressures are too high.	• Cooling is poor due to overcharged refrigerant. • Coondenser is not cooled properly. • Condenser fan is not operating properly.	• Adjust refrigerant level. • Clean condenser. • Repair condenser fan.

When expansion valve is defective (opens too widely), remote bulb is not installed properly or air is trapped in cycle.

Low-pressure side
2.5 kg/cm²



High-pressure side
19 ~ 23 kg/cm²

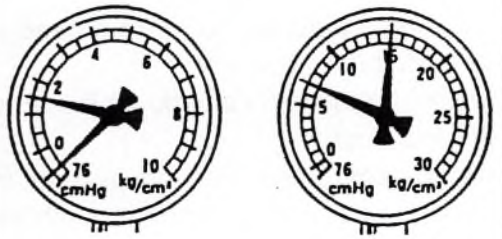


Symptom	Possible cause	Correction
• Both low and high-pressure side pressures are too high. • Much frost or dew is collected on low-pressure side pipes.	• Expansion valve is defective or remote bulb is not installed properly. • Flow rate is not adjusted properly.	• Correct installation of remote bulb.
• Both low and high-pressure side pressures are too high. • Low-pressure side pipe is not felt cold when touched.	• Air has entered system.	• Replace receiver dryer.

When water has entered cycle

Low-pressure side
50 cmHg ~ 1.5 kg/cm²

High-pressure side
7 ~ 15 kg/cm²

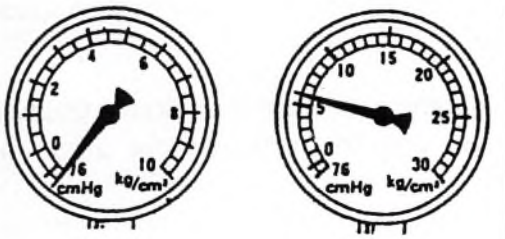


Symptom	Possible cause	Correction
• Low-pressure side pressure sometimes becomes negative and normal at other times during driving.	• Water trapped in system gets frozen at expansion valve and closes it temporarily.	• Replace receiver dryer and evacuate system completely.

When refrigerant fails to circulate

Low-pressure side
76 cmHg

High-pressure side
6 kg/cm²



Symptom	Possible cause	Correction
• Low-pressure side indicates negative pressure and high-pressure side indicates low pressure. • Frost or dew is collected on pipes before and after receiver or expansion valve.	• Dust, water, etc. is attached or frozen inside of expansion valve and hinders refrigerant flow. • There is gas leakage in remote bulb.	• Replace receiver dryer and expansion valve. • If remote bulb is defective, replace expansion valve.

ON-VEHICLE SERVICE

NOTE:
When servicing air conditioning system, the following rules must be observed.

WIRING:

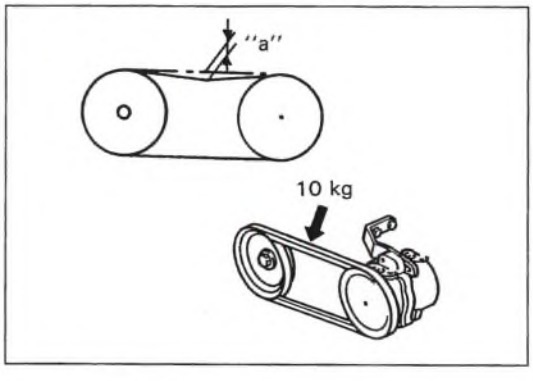
1) Disconnect battery negative terminal to prevent any short circuit.
2) Connect wire connectors securely.
3) When routing a wire harness through a panel hole, previously insert a rubber bushing into the hole for its protection.
4) Use a vinyl tape or original clamps to connect air conditioner wire harness to main wire harness.
5) If original harness has been disconnected or removed while servicing, return it to a proper position.
6) During their installation, be careful not to pinch original and air conditioning wire harnesses.
7) When adding lead wires to wire harness by soldering, use those lead wires which share the same diameter and tape each connection.
8) Keep wire harness away from any components moving or subjected to high temperature.
9) Keep connecting portions away from fuel lines.
10) Make sure that wire harness makes no contact to a sharp edge or corner.

REFRIGERANT LINES:

1) Never use heat for bending pipes.
 When bending a pipe, try to make a bend as slight as possible.
2) Keep internal parts of air conditioner free from moisture and dust.
 When disconnecting any line from system, install a blind plug or cap to fitting of such line immediately.
3) When connecting hoses and pipes to each other respectively, previously apply a few drops of refrigerating oil to seats of coupling nuts and O-ring.

 NOTE:
 Never use any other compressor oil than specified one.

4) When tightening or loosening a fitting, use two wrenches, one for turn and the other for support.
5) Reciver/dryer inlet fitting must be connected to the pipe from condenser outlet fitting.
6) Tighten flared nuts to specified torque as shown in p. 1B-13.
7) Route drain hose so that drained water does not make any contact to car components.



DRIVE BELT

INSPECTION

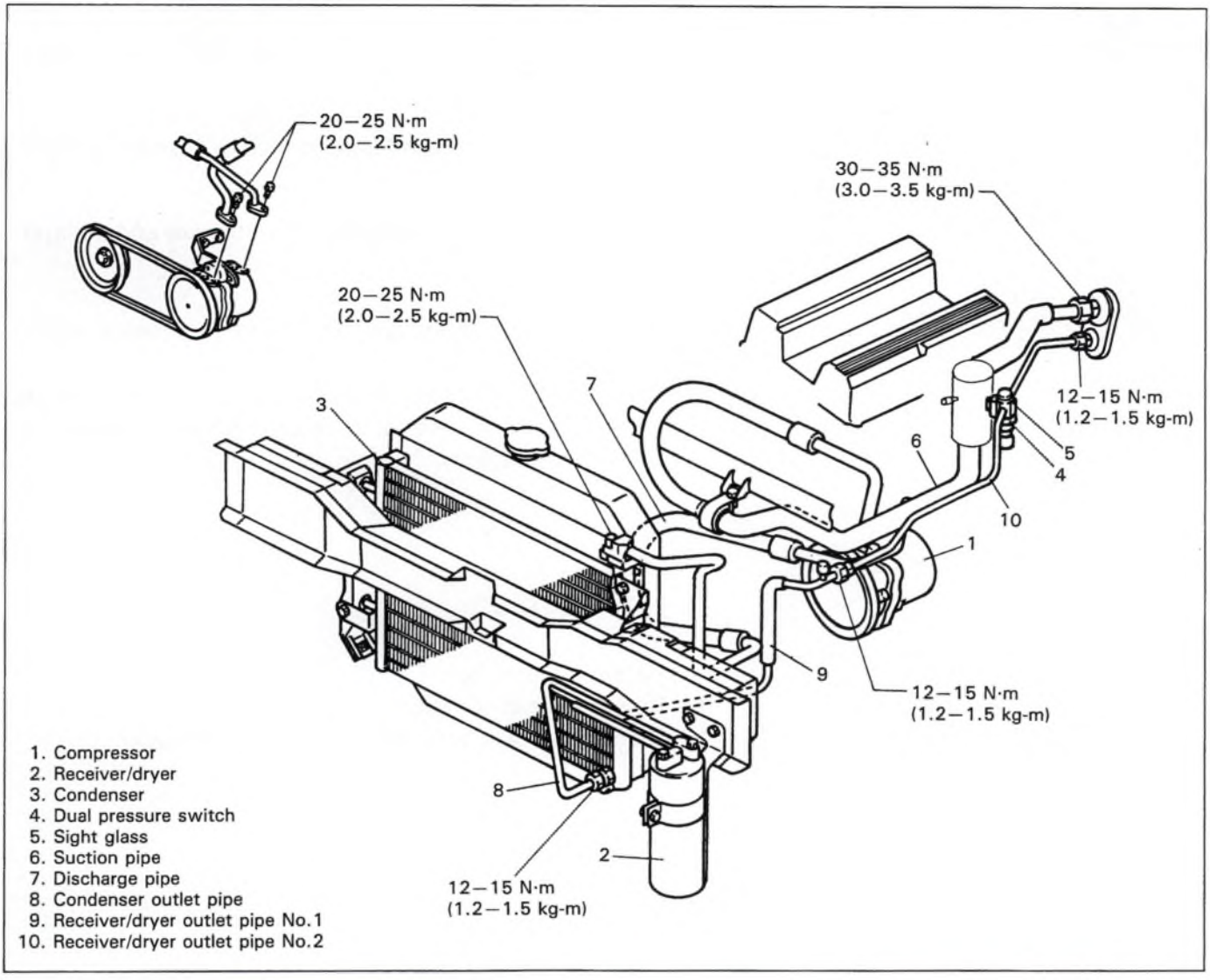
1) Check belt for wear and crack, and replace it as required.
2) Check belt tension by measuring how much it deflects when pushed at intermediate point between compressor pulley and crank pulley with about 10 kg force.

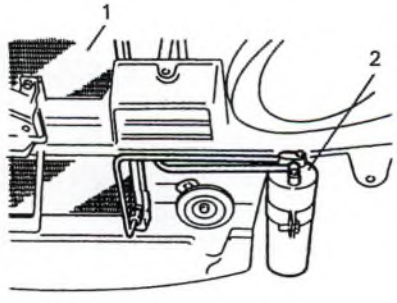
Deflection of A/C belt
"a": 10—12 mm

IDLE SPEED/IAC DUTY WITH A/C ON ADJUSTMENT

Refer to SECTION 6E.

A/C SYSTEM PARTS



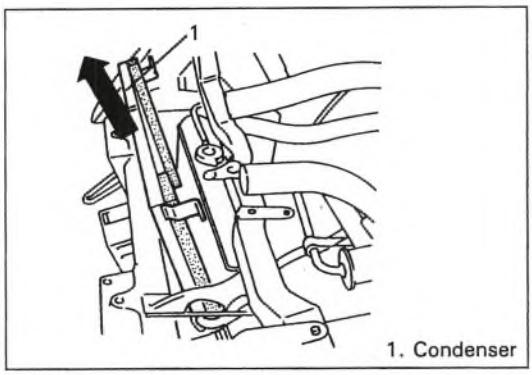


REMOVAL

NOTE:

- **When disconnecting any line from system, install a blind plug or cap to fitting of such line immediately to keep internal parts of air conditioning system free from moisture and dust.**
- **Recover refrigerant by using recovery and recycling equipment. Be sure to follow the instruction manual for the equipment.**
 The amount of compressor oil removed must be measured and the same amount added to the system.

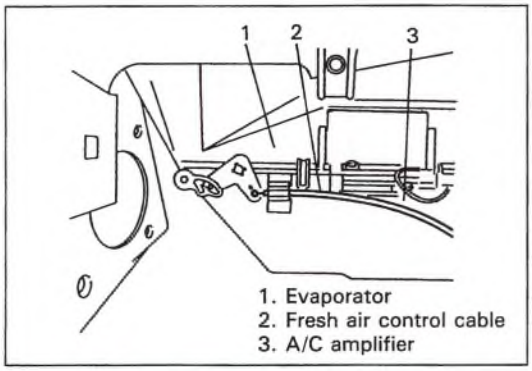
1) Remove intercooler upper cover.
2) Remove bumper.
3) Remove receiver/dryer.



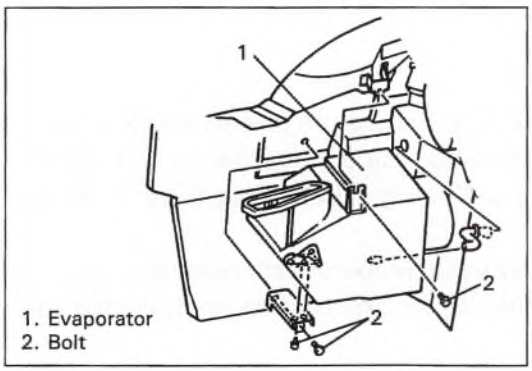
4) Remove intercooler.
5) Remove air cleaner box.
6) Remove compressor discharge hose and condenser outlet pipe.
7) Remove radiator and condenser mounting bolts.
8) Move radiator rearward and remove condenser upward.

NOTE:
Be careful not to damage fins of condenser and radiator.

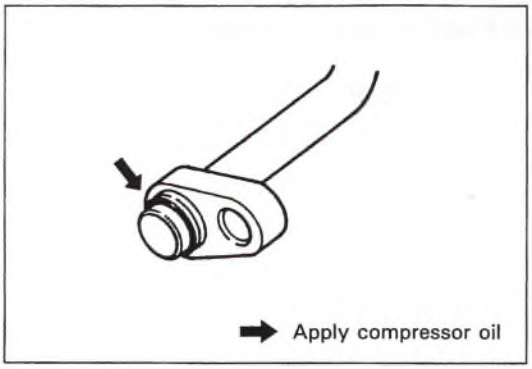
9) Remove suction hose, discharge hose, receiver/dryer outlet hoses No.1 and No.2.
10) Remove lower side mounting bolts (2 pcs, from vehicle lower side) and upper side mounting bolt, and then remove compressor.



11) Remove glove box.
12) Remove fresh air control cable.
13) Disconnect A/C amplifier lead wire at coupler.



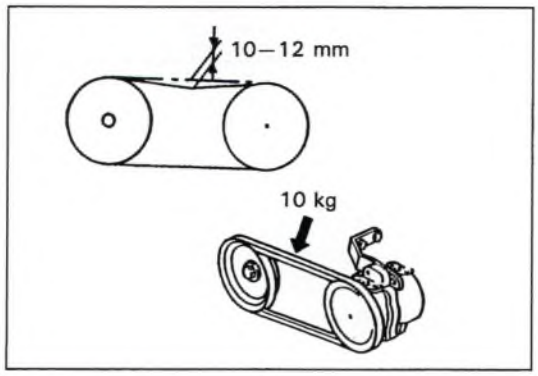
14) Disconnect evaporator mounting bolts and remove evaporator.



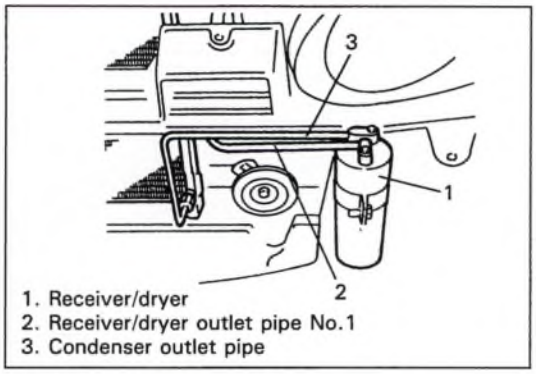
INSTALLATION

Install in reverse order of removal procedure noting following points.

- For hose connection, be sure to use new O-ring and apply A/C oil.

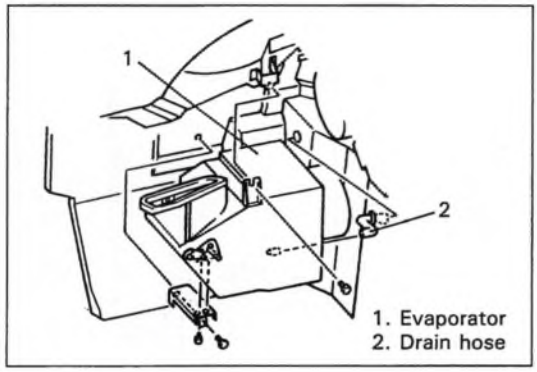


- After installing compressor, adjust belt slack.



1. Receiver/dryer
2. Receiver/dryer outlet pipe No.1
3. Condenser outlet pipe

- Use care that receiver/dryer is installed in correct direction.



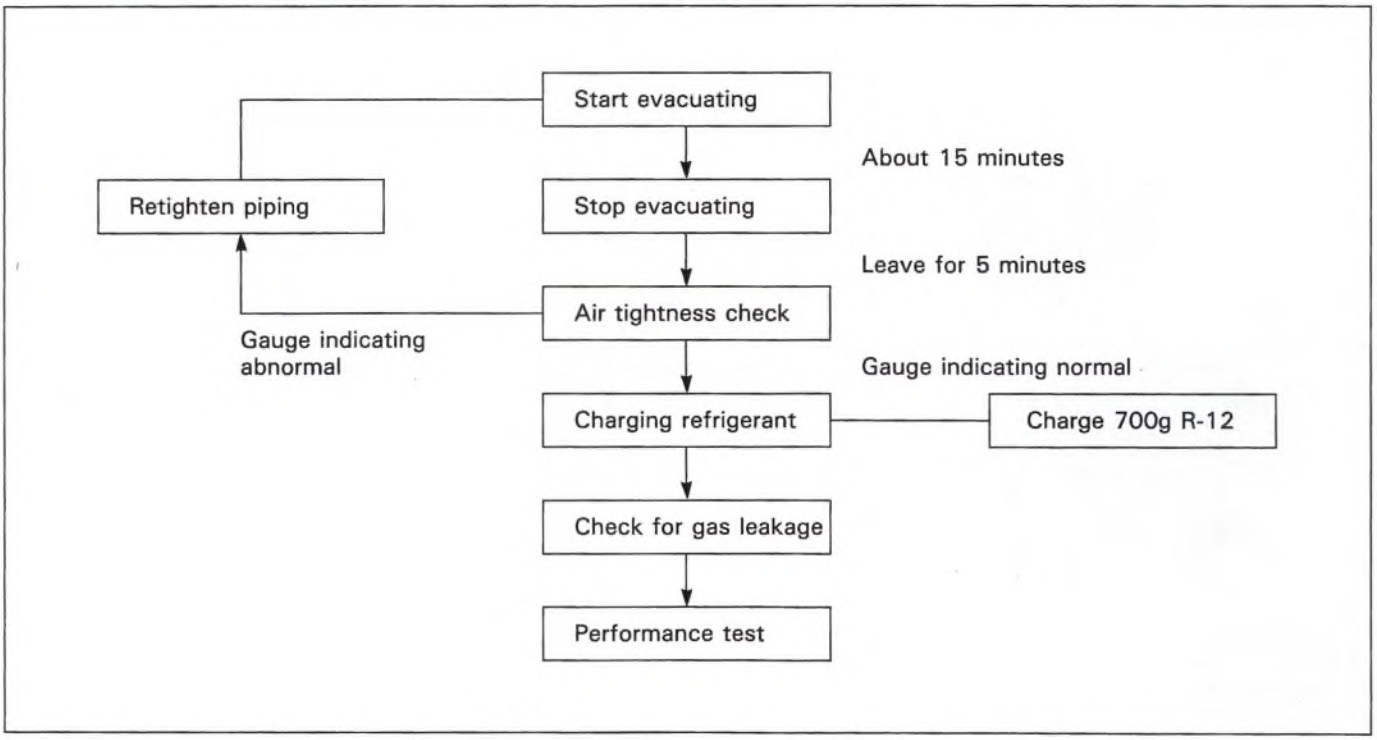
1. Evaporator
2. Drain hose

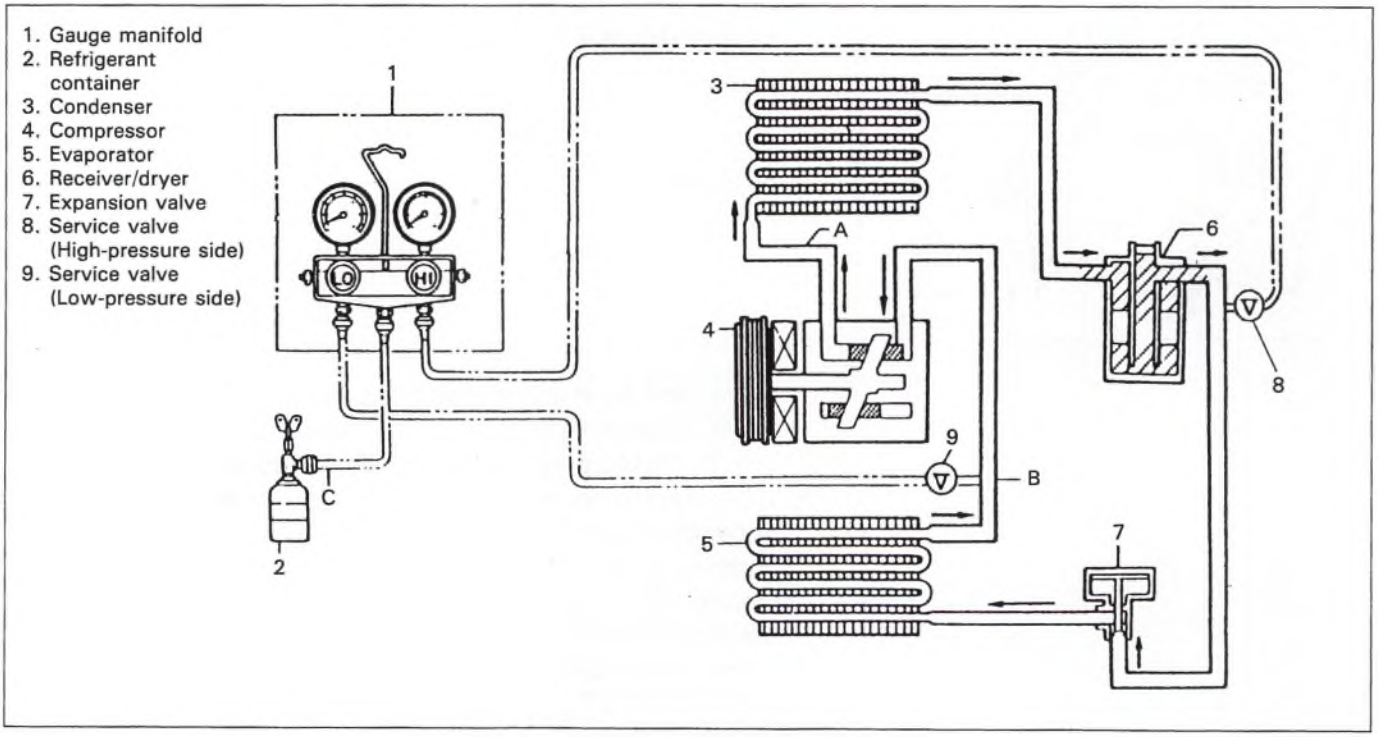
- When installing drain hose, make sure that water from evaporator will not drip inside vehicle.

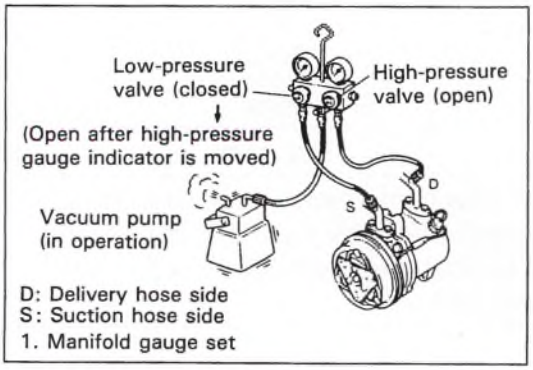
- Never use heat for bending pipes.
- When tightening or loosening a fitting, use two wrenches, one for turning and the other for supporting.
- When replacing air conditioning parts with new ones, it is necessary to replenish oil by the amount supposedly remaining in each part.
 Listed below are amounts of oil to be replenished. Using them as reference, fill oil with suction hose disconnected from compressor.

Replacement part	Amount of oil to be replenished
Evaporator	25cc
Condenser	10cc
Receiver/dryer	20cc
Hoses or pipes	5cc each
150cc oil is filled in new compressor and sealed. When replacing compressor with new one, let out oil from new compressor so that same amount of oil is in it as that in old compressor.	

CHARGING REFRIGERANT

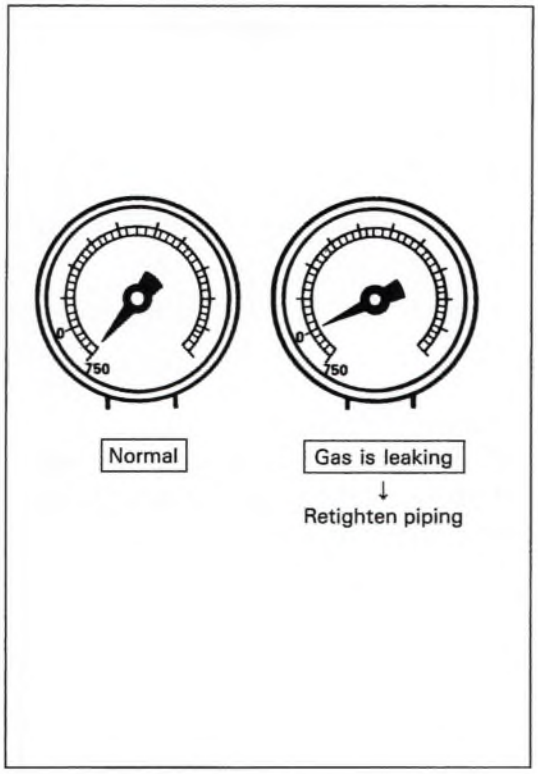






Evacuating System

1) Connect manifld gauge set as shown in figure.
 High-pressure side—Delivery side pipe.
 Low pressure side —Suction side pipe.
2) Connect charging hose of manifold gauge set to vacuum pump.
3) Operate vacuum pump, and then open delivery-side valve (Hi) of manifold gauge set.
 If there is no blockage in the system, there will be an indication on low-pressure gauge.
 When this occurs, open the other-side valve (Lo) of the set

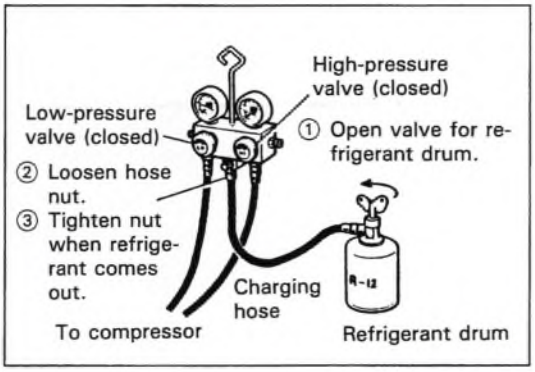


4) Approx. 10 minutes later, low pressure gauge should show about 760 mmHg vacuum providing no leakage exists.

NOTE:

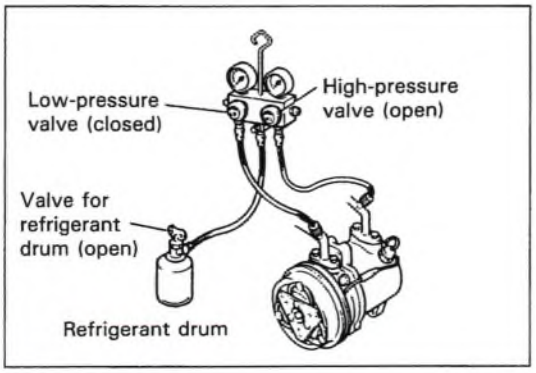
- **If the system does not show about 760 mmHg vacuum, close both valves, stop vacuum pump and watch movement of low pressure gauge.**
- **Increase in the gauge reading suggests existence of leakage. In this case, repair the system before continuing its evacuation.**
- **If the gauge shows a stable reading (suggesting no leakage), continue evacuation.**

5) Evacuation should be carried out for a total of at least 15 minutes.
6) Continue evacuation until low pressure gauge indicates about 760 mmHg vacuum, and then close both valves.
7) Stop vacuum pump. Disconnect center charging hose from pump inlet. Now, the system is ready for charging refrigerant.



8) Purge air from charging hose.

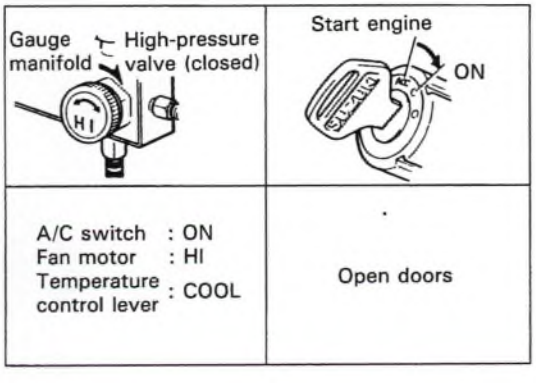
NOTE:
Air purging is also necessary when replacing refrigerant drum.



Charging System

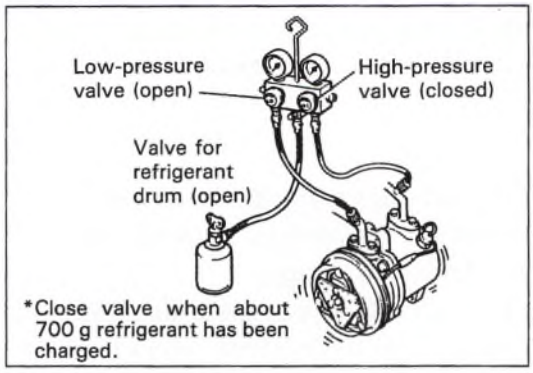
9) Charge refrigerant through high-pressure side

CAUTION:
1. Don't run engine.
2. Keep low-pressure valve closed.

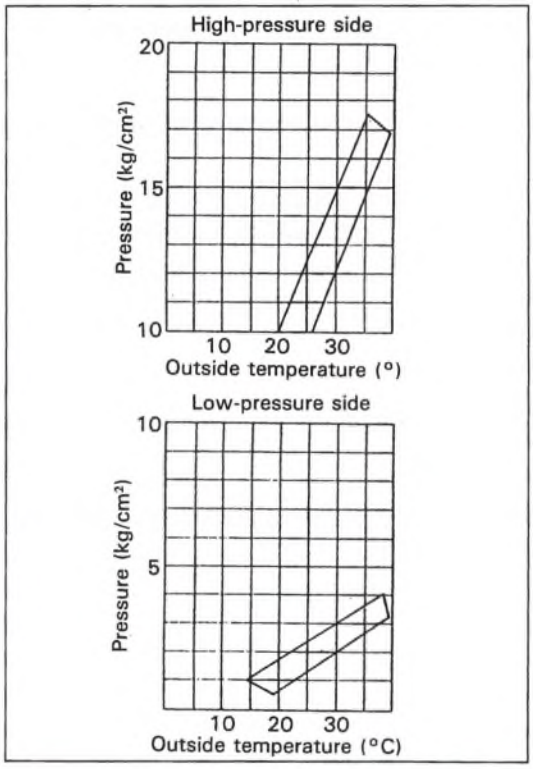


10) Prepare vehicle for charging through low pressure side, as indicated at the left

WARNING:
Make sure to close high-pressure valve, or refrigerant drum may explode.



11) Charge refrigerant through low pressure side.



12) Check amount of charged refrigerant.
Pressure registered on gauge varies with ambient temeprature. Therefore, use following graphs when determining if adequate amount has been charged.

Example:

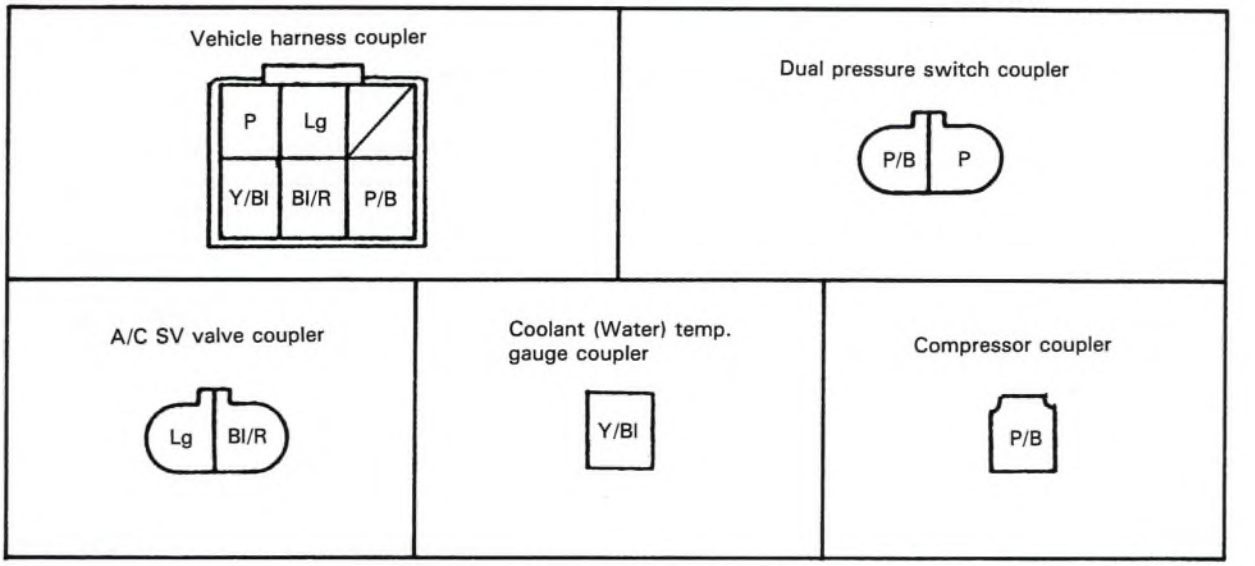
Gauges should read as follows when ambient temperature is 30°C	
Pressure on high-pressure side (HI):	12 ~ 15 kg/cm²
Pressure on low-pressure side (LO)	2 ~ 3 kg/cm²

PRECAUTION ON WIRING HARNESS SERVICING

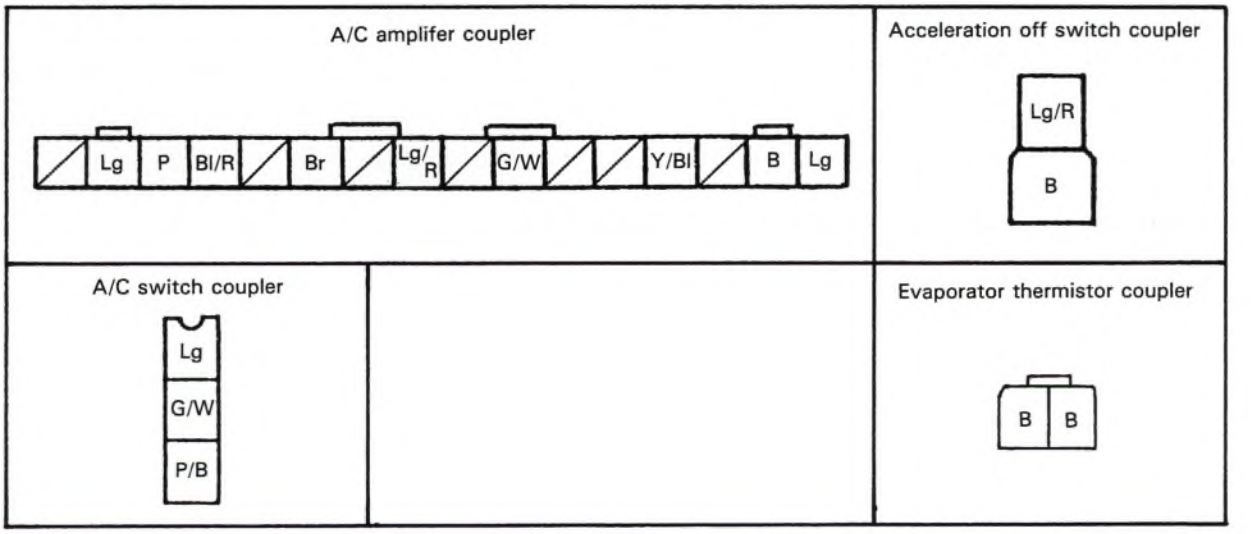
NOTE:
See NOTE at the beginning of ON-VEHICLE SERVICE of this section.

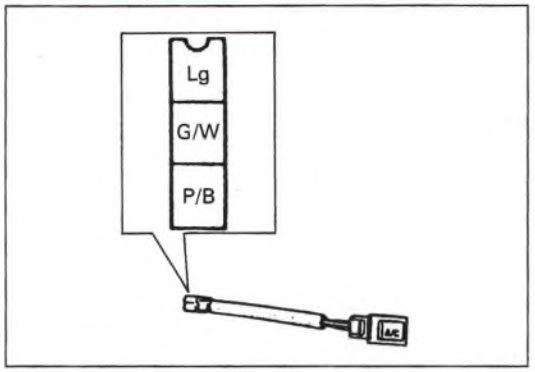
Termainal Arrangement of A/C Harness Couplers

Engine room



Cabin (vehicle harness)





A/C Switch

Inspection

Check switch for continuity at each switch position.

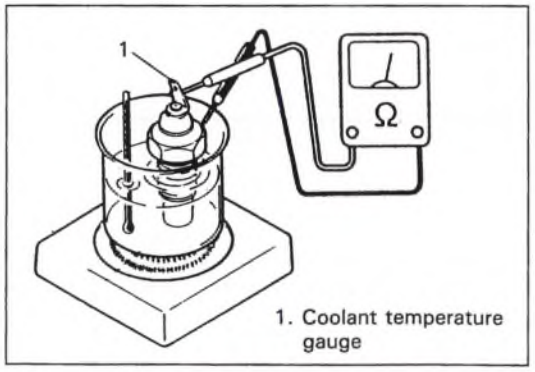
	P/B	G/W	Lg
OFF			
ON	○	○	

Evaporator Thermistor

Inspection

Use an ohmmeter to check resistance of thermistor.

Temperature (°C)	Resistance (Ω)
3	6317±320
25	2286±230



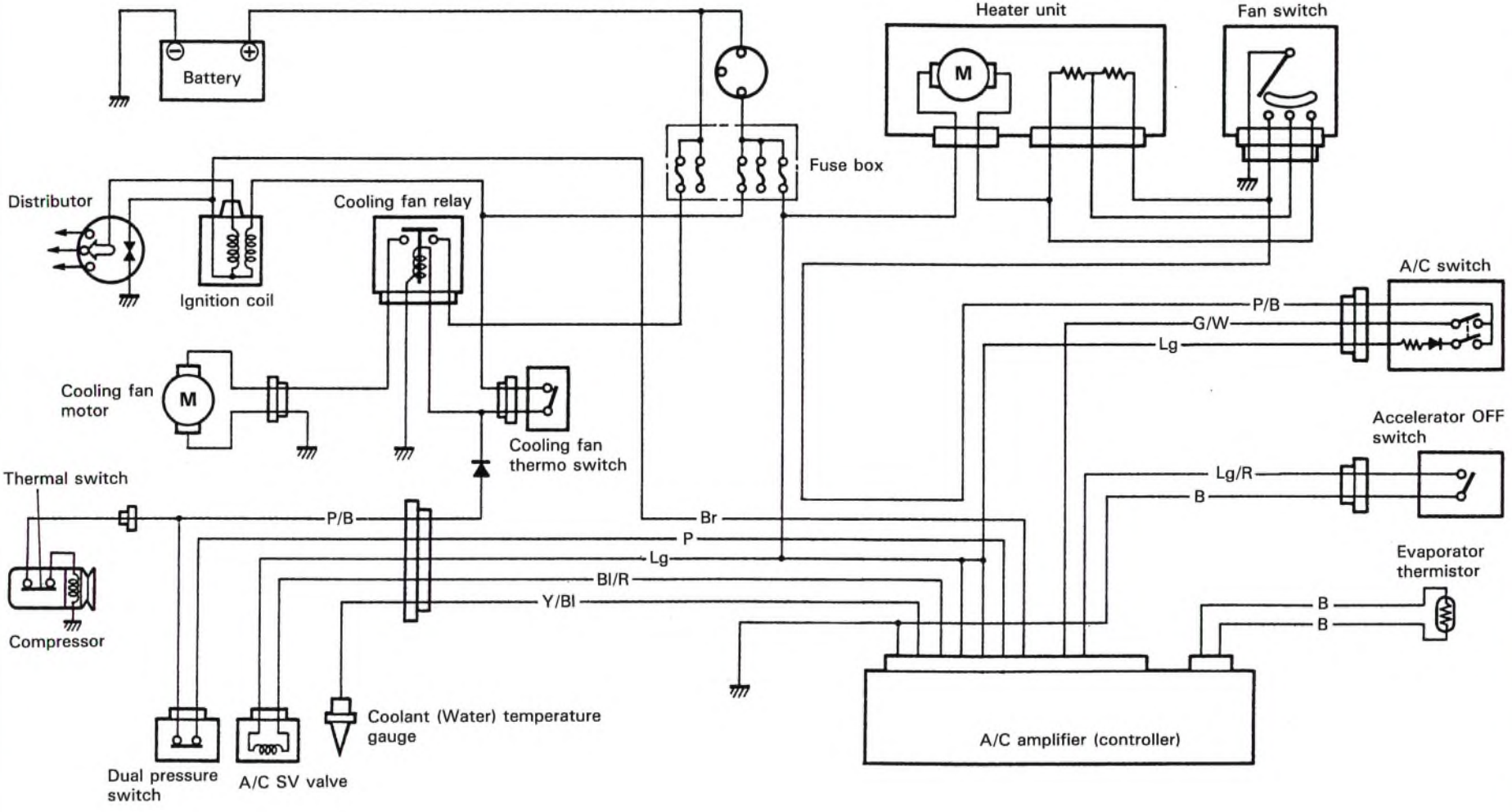
1. Coolant temperature gauge

Coolant (Water) Temperature Gauge

Inspection

Use on ohmmeter to check resistance of coolant temperature gauge.

Temperature (°C)	Resistance (Ω)
80	47.5—56.8
100	26.2—29.3


Battery
Heater unit
M
Fan switch
Fuse box
Distributor
Ignition coil
Cooling fan relay
A/C switch
P/B
G/W
Lg
Cooling fan motor
M
Cooling fan thermo switch
Accelerator OFF switch
Lg/R
B
Thermal switch
P/B
Br
P
Lg
Bl/R
Y/Bl
Evaporator thermistor
B
B
Compressor
Coolant (Water) temperature gauge
Dual pressure switch
A/C SV valve
A/C amplifier (controller)

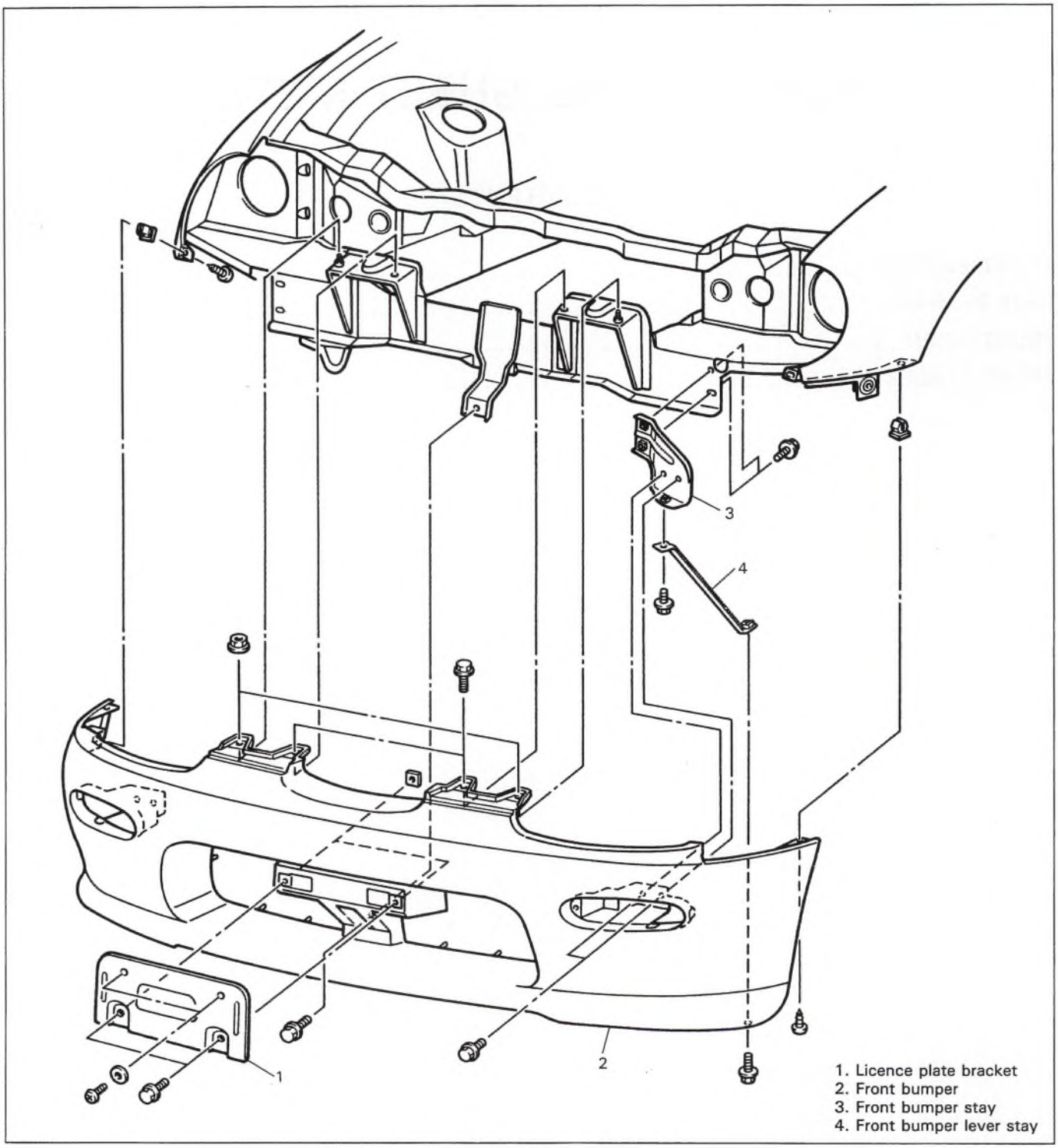
SECTION 2

BUMPER AND SHEET METAL

CONTENTS

FRONT BUMPER 2-2
REAR BUMPER 2-3
FRONT HOOD 2-4
FRONT FENDER 2-6

FRONT BUMPER



1. Licence plate bracket
2. Front bumper
3. Front bumper stay
4. Front bumper lever stay

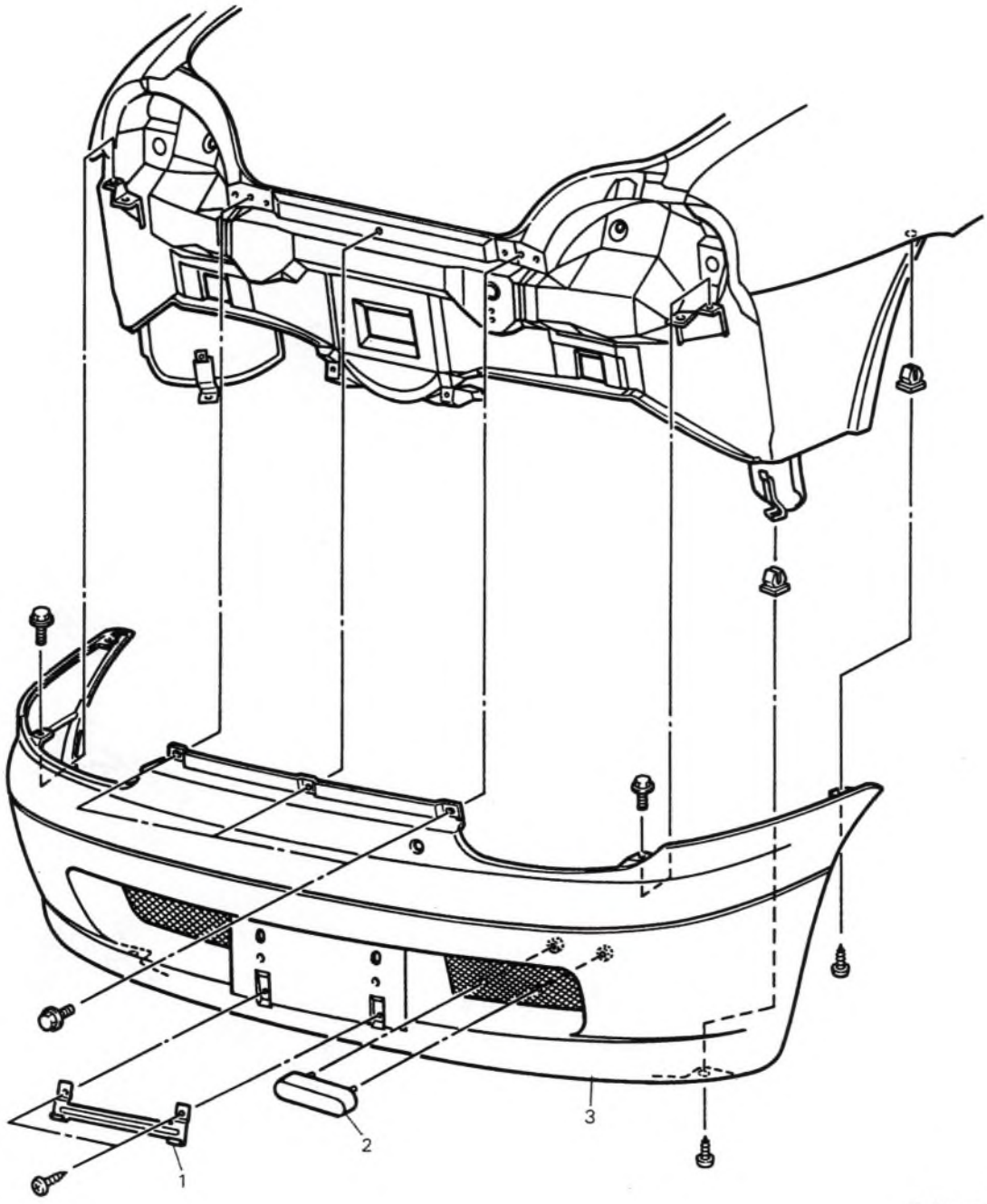
REMOVAL

1) Remove front fender lining.
2) Disconnect front turn signal light wire at coupler.
3) Remove front bumper attaching nuts and screws referring to above figure.
4) Slide bumper forward to remove it.

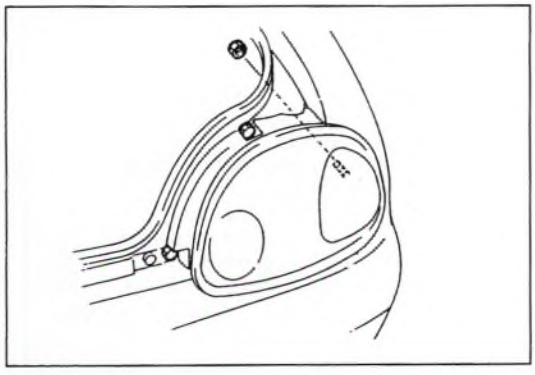
INSTALLATION

Install in reverse order of removal procedure.

REAR BUMPER



1. Licence plate bracket
2. Back-up light
3. Rear bumper



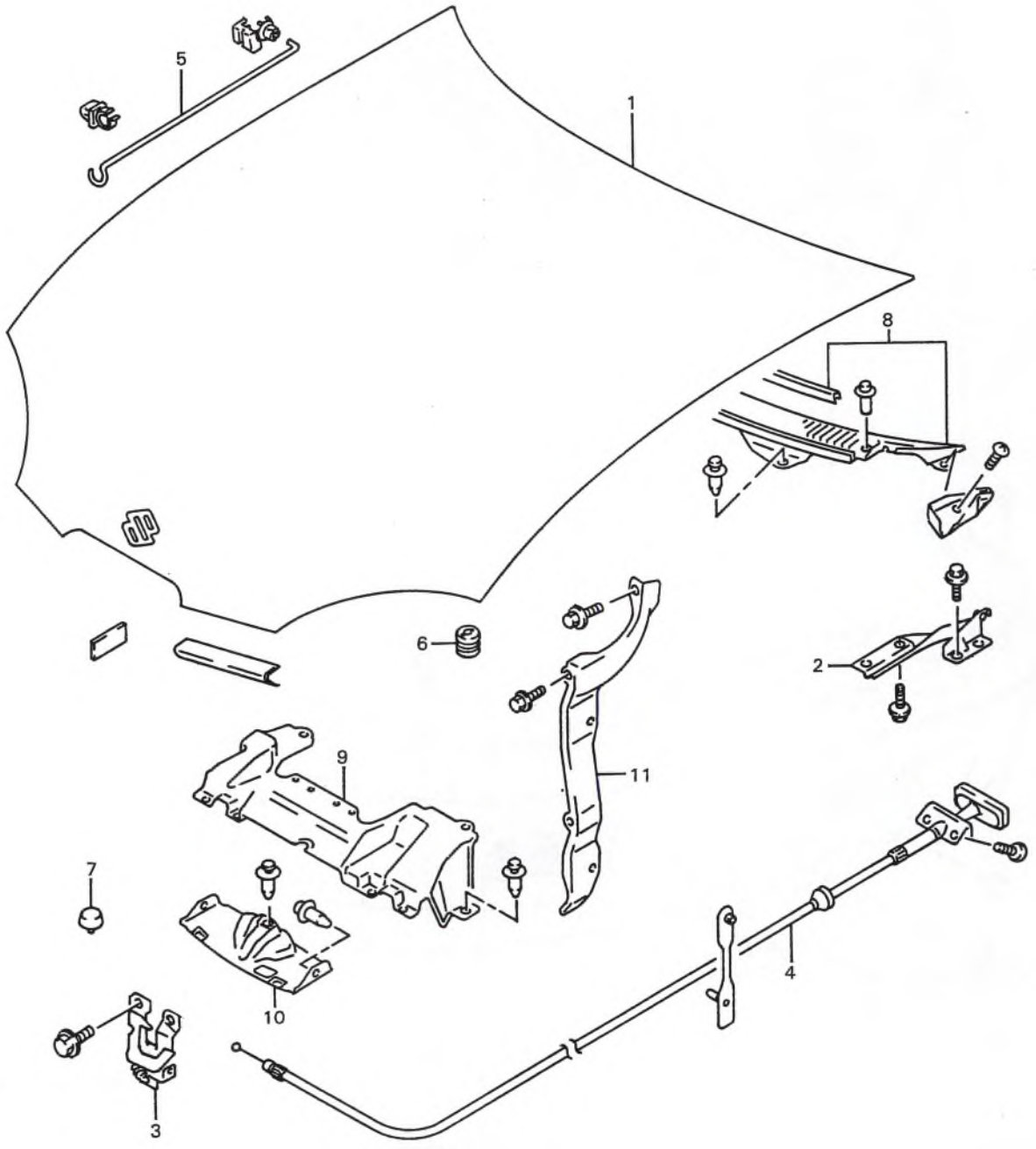
REMOVAL

1) Remove rear combination light.
2) Disconnect back-up light and licence light wire at coupler.
3) Remove rear bumper attaching nuts and screws referring to above figure.
4) Slide bumper backward to remove it.

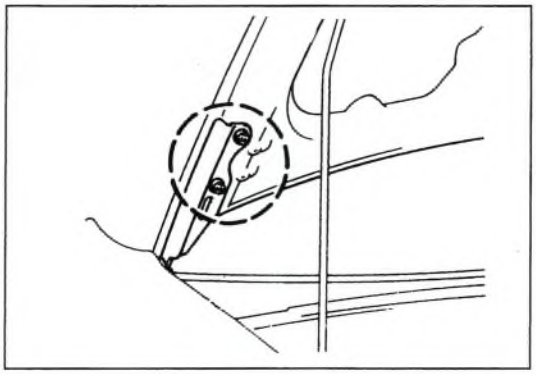
INSTALLATION

Install in reverse order of removal procedure.

FRONT HOOD



1. Front hood panel
2. Front hood hinge
3. Hood latch
4. Hood latch release cable
5. Front hood stay
6. Front hood cushion
7. Front hood No.2 cushion
8. Cowltop garnish
9. Engine room front cover
10. Engine room front lower cover
11. Radiator stay

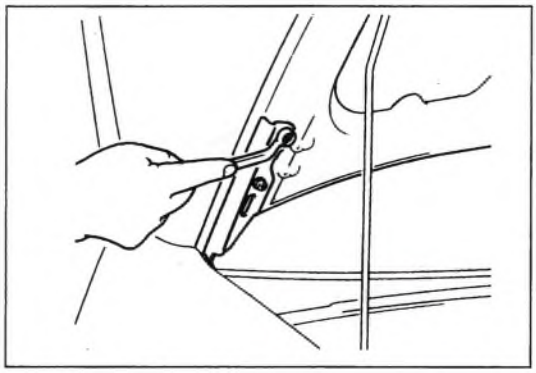


REMOVAL

Remove front hood by removing attaching bolts (4 pcs.).

INSTALLATION

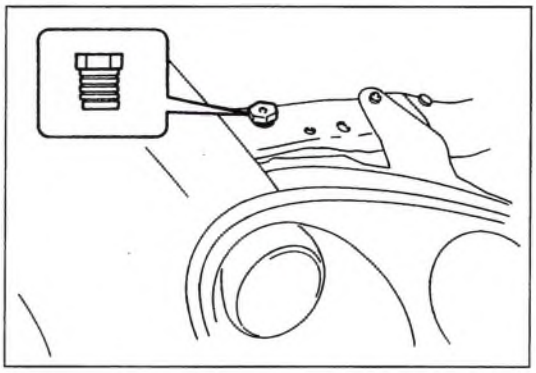
Install in reverse order of removal procedure.



ADJUSTMENT

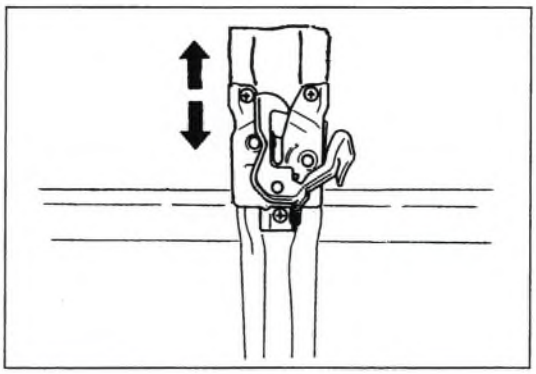
Fore-and-aft and right-and-left adjustment

Loosen four mounting bolts for adjustment.



Vertical adjustment

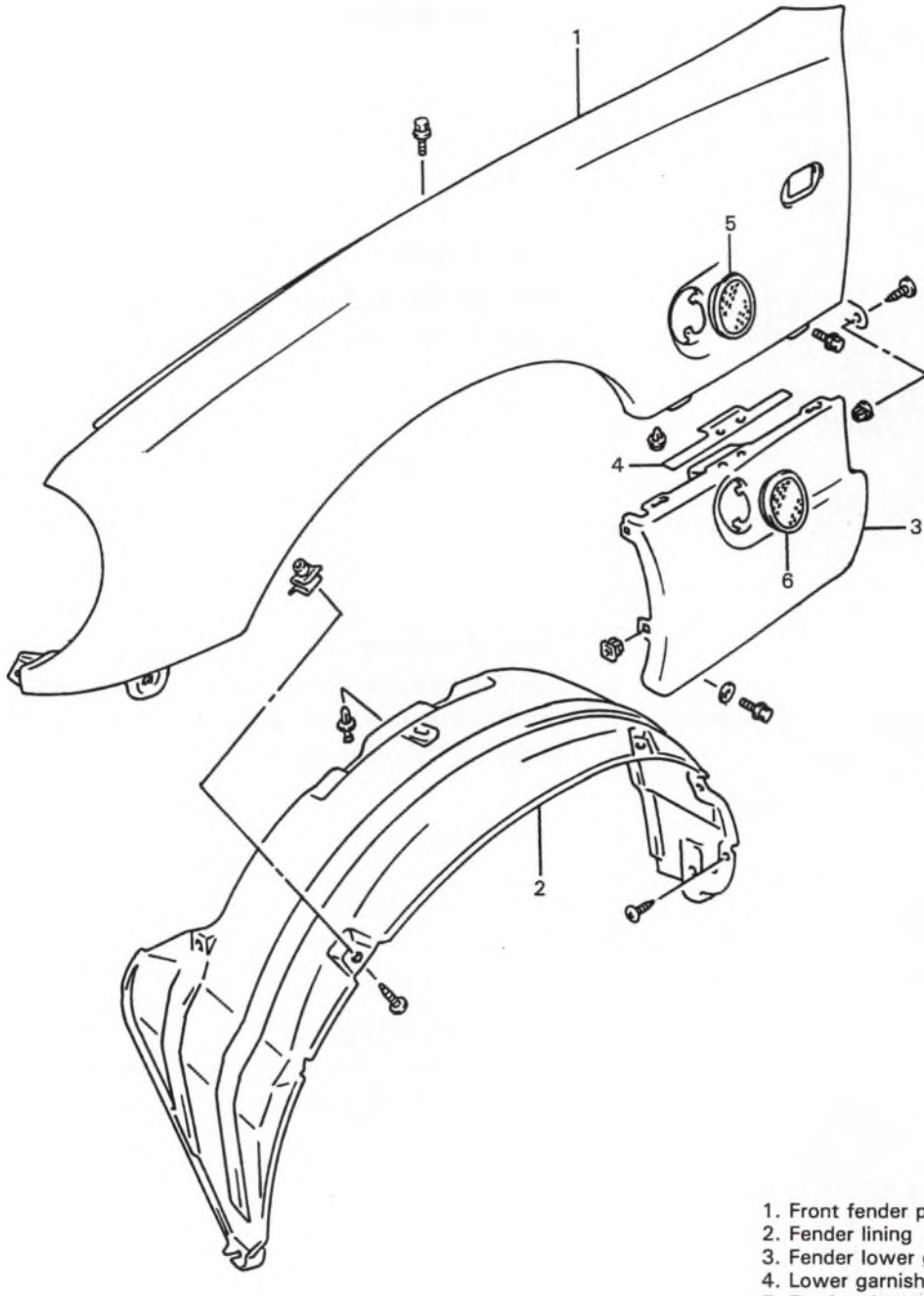
If only one side (right or left) of hood is not level with front fender, make height adjustment properly by tightening or loosening hood cushion.



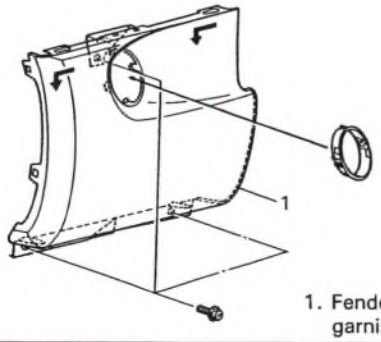
Hood latch adjustment

If lock fails to work when hood panel is closed, loosen hood latch fixing bolt and move latch for adjustment.

FRONT FENDER



1. Front fender panel
2. Fender lining
3. Fender lower garnish
4. Lower garnish protector
5. Fender air outlet upper garnish
6. Fender air outlet lower garnish



1. Fender lower garnish

REMOVAL

1) Remove front fender lining.
2) Remove front fender garnish.
3) Remove bulb from side turn signal light.
4) Remove front fender by removing attaching nuts and screws referring to above figure.

INSTALLATION

Install in reverse order of removal procedure.

SECTION 3

STEERING, SUSPENSION, WHEELS AND TIRES

DIAGNOSIS 3-1
FRONT END ALIGNMENT 3A-1
MANUAL RACK AND PINION 3B-1
STEERING COLUMN 3C-1
FRONT SUSPENSION 3D-1
REAR SUSPENSION 3E-1
WHEELS AND TIRES 3F-1

CONTENTS

GENERAL DIAGNOSIS 3-1
TIRE DIAGNOSIS 3-6
Irregular and/or Premature Wear 3-6
Wear Indicators 3-6
Radial Tire Waddle 3-6
Radial Tire Lead 3-8
VIBRATION DIAGNOSIS 3-8

64B40-3-1-1

GENERAL DESCRIPTION

Since the problems in steering, suspension, wheels and tires involve several systems, they must all be considered when diagnosing a complaint. To avoid using the wrong symptom, always road test the vehicle first. Proceed with the following preliminary inspection and correct any defects which are found.

1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist and inspect front and rear suspension and rack and pinion for loose or damaged parts.
3) Spin front wheels. Inspect for out-of-round tires, out-of-balance tires, bent rims, loosen and/or rough wheel bearings.

GENERAL DIAGNOSIS CHART A

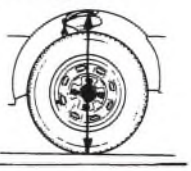
Condition	Possible Cause	Correction
Vehicle Pulls (Leads)	1. Mismatched or uneven tires.	Replace tire.
	2. Tires not adequately inflated.	Adjust tire pressure.
	3. Broken or sagging springs.	Replace spring.
	4. Radial tire lateral force.	Replace tire.
	5. Disturbed front end alignment.	Check and adjust front end alignment.
	6. Disturbed rear wheel alignment.	Check and adjust rear wheel alignment.
	7. Brake dragging in one road wheel.	Repair front brake.
	8. Loose, bent or broken front or rear suspension parts.	Tighten or replace suspension parts.

64B40-3-1-2

GENERAL DIAGNOSIS CHART B		
Condition	**Possible Cause**	**Correction**
Abnormal or Excessive Tire Wear	1. Sagging or broken spring.	Replace spring.
	2. Tire out of balance.	Adjust balance or replace tire.
	3. Disturbed front or rear end alignment.	Check and adjust front end alignment.
	4. Faulty shock absorber.	Replace.
	5. Hard driving.	Replace tire.
	6. Overloaded vehicle.	Replace tire.
	7. Not rotating tire.	Replace or rotate tire.
	8. Worn or loose road wheel bearing.	Replace wheel bearing.
	9. Wobbly wheel or tire.	Replace wheel or tire.
	10. Tires not adequately inflated.	Adjust tire pressure.
Wheel Tramp	1. Blister or bump on tire.	Replace tire.
	2. Improper shock absorber action.	Replace.
Shimmy, Shake or Vibration	1. Tire or wheel out of balance.	Balance wheels or replace tire and/or wheel.
	2. Loosen wheel bearings.	Replace wheel bearing.
	3. Worn tie rod ends.	Replace tie rod end.
	4. Worn lower or upper ball joint.	Replace front suspension arm.
	5. Excessive wheel runout.	Repair or replace wheel and/or tire.
	6. Blister or bump on tire.	Replace tire.
	7. Excessively loaded radial runout of tire/wheel assembly.	Replace tire or wheel.
	8. Disturbed front end alignment.	Check and adjust front end alignment.
	9. Loose or worn steering linkage.	Tighten or replace steering linkage.
	10. Loose steering gear case bolts.	Tighten case bolts.
Hard Steering	1. Bind in tie rod end ball studs or upper/lower ball joints.	Replace tie rod end or front suspension arm.
	2. Disturbed front end alignment.	Check and adjust front end alignment.
	3. Rack and pinion adjustment.	Check and adjust rack & pinion torque.
	4. Tire not adequately inflated.	Inflate tires to proper pressure.
	5. Bind in steering column.	Repair or replace.

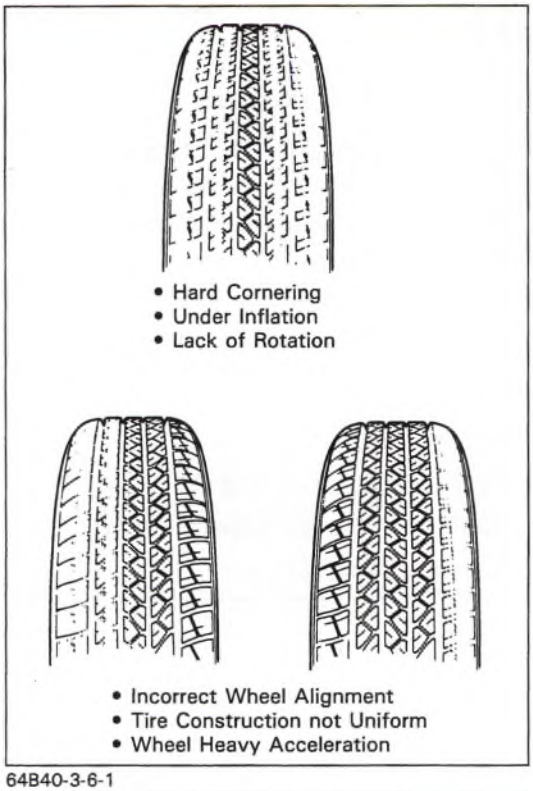
64B40-3-2-1

GENERAL DIAGNOSIS CHART C		
Condition	**Possible Cause**	**Correction**
Too Much Play In Steering	1. Wheel bearings worn.	Replace.
	2. Rack and pinion attachments loose.	Tighten or repair.
	3. Rack and pinion adjustments.	Check and adjust rack & pinion torque.
	4. Worn steering shaft joints.	Replace joint.
	5. Worn tie rod ends or tie rod inside ball joints.	Replace tie rod end or tie rod.
	6. Worn lower or upper ball joint.	Replace front suspension control arm.
Poor Returnability	1. Bind in tie rod end ball studs.	Replace tie rod end.
	2. Bind in ball joints.	Replace.
	3. Bind in steering column.	Repair or replace.
	4. Poorly lubricated rack and pinion.	Check, repair or lubricate rack & pinion.
	5. Disturbed front end alignment.	Check and adjust front end alignment.
	6. Rack and pinion adjustment.	Check and adjust rack & pinion torque.
	7. Tires not adequately inflated.	Adjust tire pressure.
Rack and Pinion Noise (Rattle or Chuckle)	1. Rack and pinion attachments loose.	Tighten steering gear case mounting bolts.
	2. Worn rack bush.	Replace.
	3. Rack and pinion adjustment.	Check and adjust rack & pinion torque.
Abnormal Noise, Front End	1. Worn, sticky or loose tie rod ends, lower/upper ball joints or tie rod inside ball joints.	Replace tie rod end, suspension arm or tie rod.
	2. Damaged shock absorber or mountings.	Repair or replace.
	3. Worn suspension arm bushings.	Replace.
	4. Loose stabilizer bar.	Tighten bolts or nuts, replace bushes.
	5. Loose wheel nuts.	Tighten wheel nuts.
	6. Loose suspension bolts or nuts.	Tighten suspension bolts or nuts.
	7. Broken or otherwise damaged wheel bearings.	Replace.
	8. Broken suspension springs.	Replace.
	9. Poorly lubricated or worn shock absorber bearings.	Lubricate or replace shock absorber bearing.
	10. Worn or sticky stabilizer joints.	Replace.

GENERAL DIAGNOSIS CHART D		
Condition	**Possible Cause**	**Correction**
Wander Or Poor Steering Stability	1. Mismatched or uneven tires.	Replace or inflate tires to proper pressure.
	2. Loosen ball joints and tie rod ends.	Replace suspension arm or tie rod end.
	3. Faulty shock absorber or mounting.	Replace shock absorber or repair mounting.
	4. Loose stabilizer bar.	Tighten or replace stabilizer bar or bush.
	5. Broken or sagging springs.	Replace spring.
	6. Rack and pinion adjustment.	Check and adjust rack and pinion torque.
	7. Front end alignment.	Check and adjust front end alignment.
	8. Loose stabilizer joints.	Replace joint.
Erratic Steering When Braking	1. Worn wheel bearings.	Replace.
	2. Broken or sagging springs.	Replace coil spring.
	3. Wheel tires are inflated unequally.	Inflate tires to proper pressure.
	4. Disturbed front end alignment.	Check and adjust front end alignment.
	5. Brakes not working in unison.	Refer to Section 5.
Low Or Uneven Trim Height Right-to-left trim height (H) difference should be within 15 mm (0.6 in) with curb weight.  *Same with rear side.	1. Broken or sagging springs. 2. Over loaded. 3. Incorrect springs.	Replace. Check loading. Replace.
Ride Too Soft	1. Faulty shock absorber.	Replace shock absorber.
Suspension Bottoms	1. Overloaded. 2. Faulty shock absorber. 3. Incorrect broken or sagging springs.	Check loading. Replace shock absorber. Replace.

GENERAL DIAGNOSIS CHART E		
Condition	**Possible Cause**	**Correction**
Body Leans Or Sways In Corners	1. Loose stabilizer bar.	Tighten stabilizer bar bolts or nuts, or replace bushes or joint.
	2. Faulty shock absorbers or mounting.	Replace shock absorber or tighten mounting.
	3. Broken or sagging springs.	Replace.
	4. Overloaded.	Check loading.
Cupped Tires	1. Front shock absorbers defective.	Replace.
	2. Worn wheel bearings.	Replace.
	3. Excessive tire or wheel run-out.	Replace tire or wheel disc.
	4. Worn ball joints.	Replace front suspension arm.
	5. Tire out of balance.	Adjust tire balance.

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64B40-3-6-1

TIRE DIAGNOSIS

IRREGULAR AND/OR PREMATURE WEAR

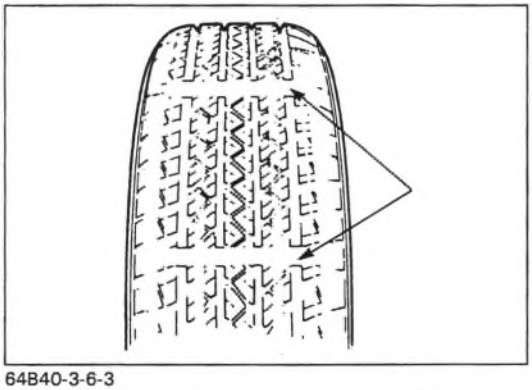
Irregular and premature wear has many causes. Some of them are: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.

If the following conditions are noted, rotation is necessary:

1. Front tire wear is different from rear.
2. Uneven wear exists across the tread of any tire.
3. Front tire wear is unequal between the right and left.
4. Rear tire wear is unequal between the right and left.
5. There is cupping, flat spotting, etc.

A wheel alignment check is necessary if following conditions are noted:

1. Front tire wear is unequal between the right and left.
2. Wear is uneven across the tread of any front tire.
3. Front tire treads have scuffed appearance with "feather" edges on one side of tread ribs or blocks.

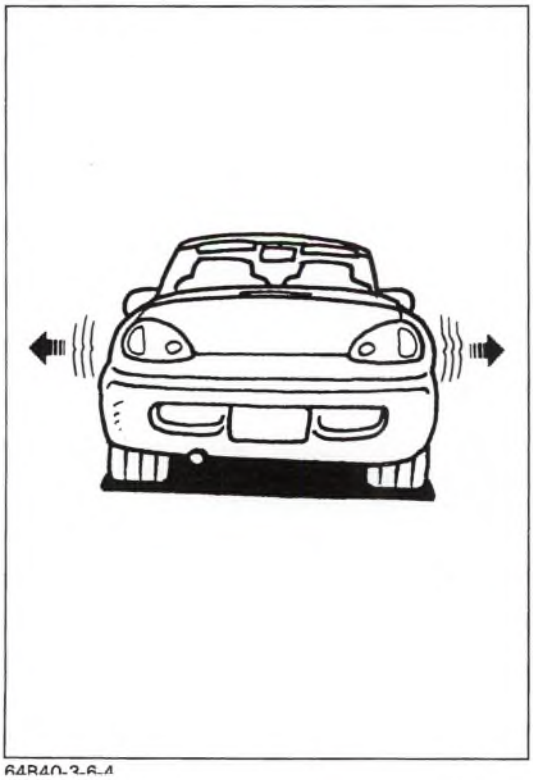


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WEAR INDICATORS

Original equipment tires have built-in tread wear indicators to show when they need replacement.

These indicators will appear as 12 mm (0.47 inch) wide bands when the tire tread depth becomes 1.6 mm (0.063 inch). When the indicators appear in 3 or more grooves at 6 locations, tire replacement is recommended.



64B40-3-6-4

RADIAL TIRE WADDLE

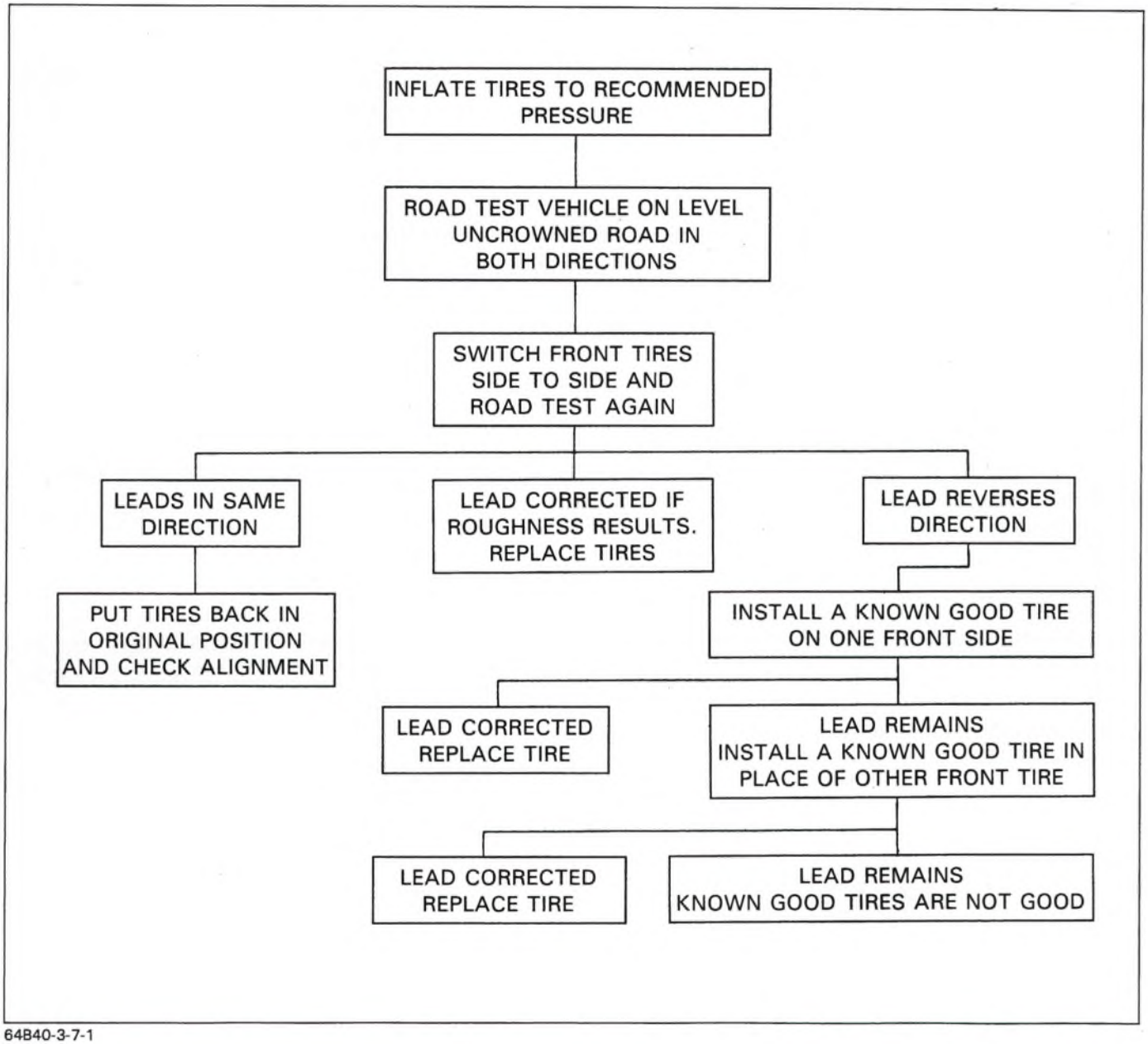
Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at a low speed, 8 to 50 km/h.

It is possible to locate the faulty tire by road testing the vehicle. If it is on the rear, the rear end of the vehicle shakes from side to side or "waddles". To the driver in his seat, it feels as though someone is pushing on the side of the vehicle.

If the faulty tire is on the front, waddling is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in the vehicle. Waddle can be quickly diagnosed by using Tire Problem Detector (TPD) and following the equipment manufacture's recommendations.

If TPD is not available, an alternative method of substituting known good tire/wheel assemblies can be used as follows, although it takes a longer time.

1. Ride vehicle to determine whether the front or rear waddles.
2. Install tires and wheels that are known to be good (on similar vehicle) in place of those on waddling end of vehicle. If waddling end cannot be identified, substitute rear ones.
3. Road test again. If improvement is noted, reinstall originals one at a time till waddle causal tire is found. If no improvement is noted, install known good tires in place of all four. Then reinstall originals in the same manner as above.



64B40-3-7-1

RADIAL TIRE LEAD

''Lead'' is the deviation of the vehicle from a straight path on a level rod even with no pressure on the steering wheel.

Lead is usually caused by:

1) Incorrect alignment.
2) Uneven brake adjustment.
3) Tire construction.

The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire has a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.

The procedure in above figure (Lead Diagnosis) should be used to make sure that front alignment is not mistaken for tire lead.

1) Part of the lead diagnosis procedure is different from the proper tire rotation pattern currently in the owner and service manuals. If a medium to high mileage tire is moved to the other side of the car, be sure to check that ride roughness has not developped.
2) Rear tires will not cause lead.

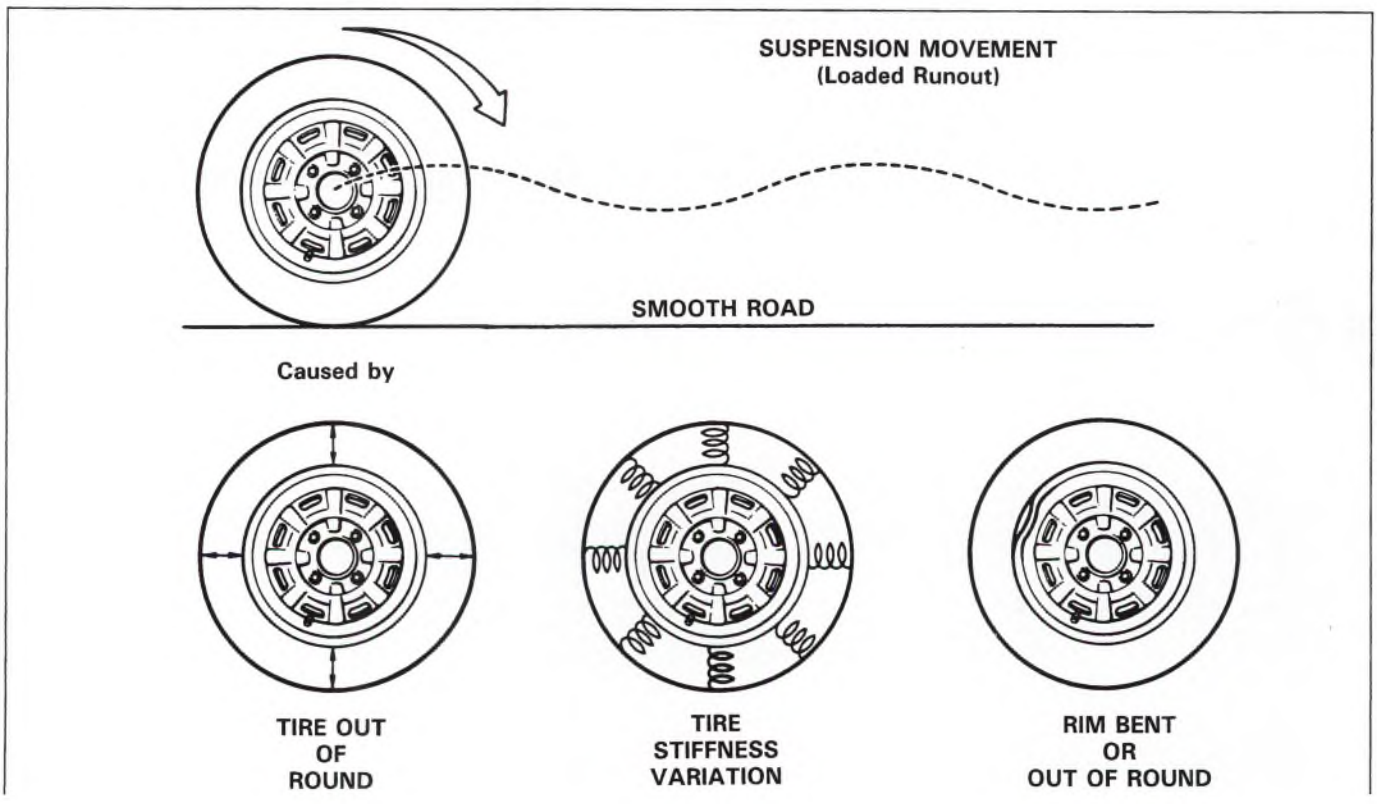
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VIBRATION DIAGNOSIS

Wheel unbalance causes most of the highway speed vibration problems. If a vibration remains after dynamic balancing, its possible causes are as follows.

1) Tire runout.
2) Wheel runout.
3) Tire stiffness variation.

Measuring tire and/or wheel free runout will uncover only part of the problem. All three causes, known as loaded ratial runout, must be checked by using a Tire Problem Detector (TPD). If TPD is not available, alternative method of substituting known good tire and wheel assemblies on the problem car can be used, although it takes a longer time.



SECTION 3A

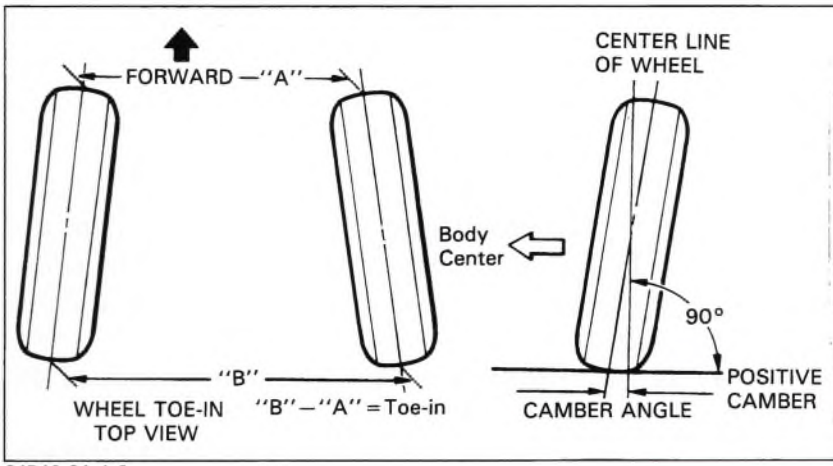
FRONT END ALIGNMENT

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Camber 3A-1
Preliminary Checks Prior to Adjusting Front Alignment 3A-2
Toe Adjustment 3A-2
Camber and Caster Adjustment 3A-2
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64B40-3A-1-1

GENERAL DESCRIPTION



Alignment service data	
Toe-in	−2 ~ +2 mm
Camber	0° ± 1°
Caster	4°30′ ± 2°
Kingpin inclination	13°30′

NOTE:
Toe-in value given above was measured by using a toe-in gauge.

64B40-3A-1-2

Front alignment refers to the angular relationship between the front wheels, the front suspension attaching parts and the ground. Generally, the only adjustment required for front alignment is toe setting. Camber and caster can't be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined. If the body is damaged, it should be repaired and if suspension is damaged, it should be replaced.

64B40-3A-1-3

TOE SETTING

Toe is the turning in or out of the front wheels. The purpose of a toe specification is to ensure parallel rolling of the front wheels (Excessive toe-in or toe-out may increase tire wear).
Amount of toe can be obtained by subtracting "A" from "B" as shown in above figure and therefore is given in mm (in.).

64B40-3A-1-4

CAMBER

Camber is the tilting of the front wheels from the vertical, as viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive. When the wheels tilt inward at the top, the camber is negative. The amount of tilt is measured in degrees.

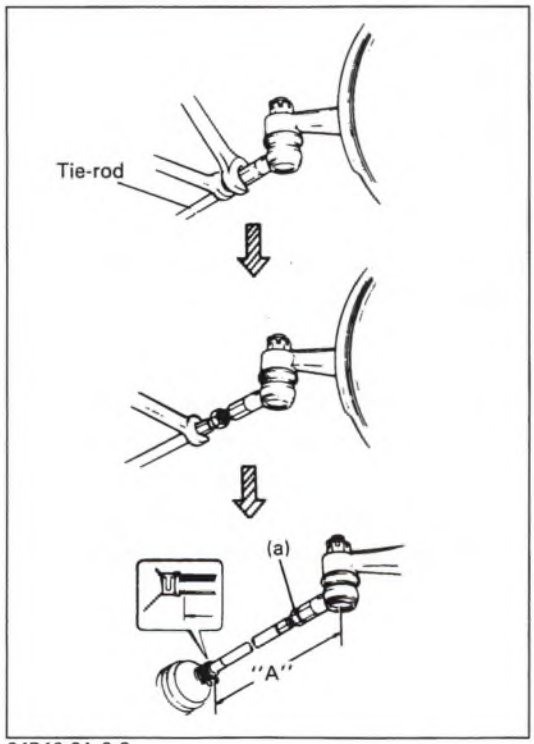
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PRELIMINARY CHECKS PRIOR TO ADJUSTING FRONT ALIGNMENT

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. ''Lead'' is the deviation of the vehicle from a straight path on a level road without hand pressure on the steering wheel. Section 3 of this manual contains a procedure for determining the presence of a tire lead problem. Before making any adjustment affecting toe setting, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

1) Check all tires for proper inflation pressures and approximately the same tread wear.
2) Check for loose of ball joints. Check tie rod ends; if excessive looseness is noted, it must be corrected before adjusting.
3) Check for run-out of wheels and tires.
4) Check vehicle trim heights; if out of limits and a correction is to be made, it must be made before adjusting toe.
5) Check for loose of suspension arms.
6) Check for loose or missing stabilizer bar attachments.
7) Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
8) Consider condition of equipment being used to check alignment and follow manufacturer's instructions.
9) Regardless of equipment used to check alignment, vehicle must be on a level surface both fore and aft and transversely.

64B40-3A-2-1



64B40-3A-2-3

TOE ADJUSTMENT

Toe is adjusted by changing the tie rod length. Loosen right and left tie rod end lock nuts first and then rotate right and left tie rods by the same amount to align toe-in to specification. In this adjustment, right and left tie rods should become equal in length (''A'' in left figure).

Before rotating tie rods, apply grease between tie rods and rack boots so that boots won't be twisted.

After adjustment, tighten lock nuts to specified torque and make sure that rack boots are not twisted.

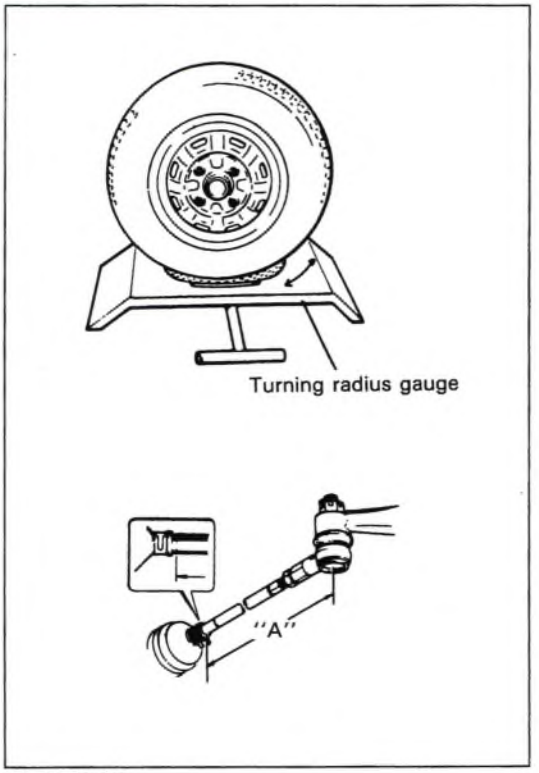
Tightening Torque

(a): 35—55 N·m (3.5—5.5 kg-m, 25.5—39.5 lb-ft)

CAMBER AND CASTER ADJUSTMENT

Should camber or caster be found out of specifications upon inspection, locate its cause first. If it is in damaged, loose, bent, dented or worn suspension parts, they should be replaced. If it is in vehicle body, repair it so as to attain specifications.

To prevent possible incorrect reading of camber or caster, vehicle front end must be moved up and down a few times before inspection.



64B40-3A-3-1

STEERING ANGLE

When tie rod or tie rod end was replaced, check toe and then also steering angle with turning radius gauge.
If steering angle is not correct, check if right and left tie rods are equal in length (''A'').

NOTE:
If tie rod lengths were changed to adjust steering angle, reinspect toe-in.

Steering angle inside : 35°
outside : 32°

Reference Information:
Side slip:
For inspecting front wheel side slip with side slip tester:

Side slip limit : IN 2—OUT 1 mm/m

If side slip exceeds limit, toe-in or front wheel alignment may not be correct.

64B40-3A-3-3

SECTION 3B

MANUAL RACK AND PINION

NOTE:
All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitue design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

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3B

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GENERAL DESCRIPTION

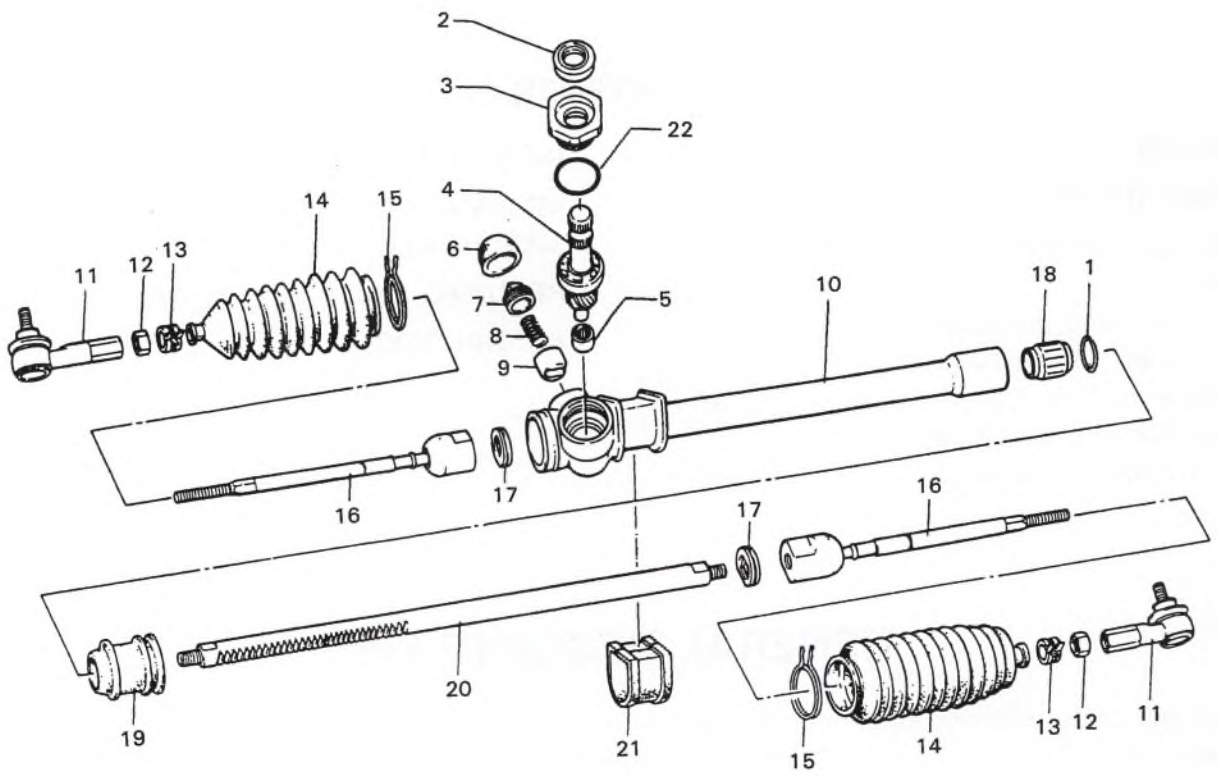
The rack and pinion steering system consists of two main components, the rack and the pinion. When the steering wheel is turned, the motion is transmitted to the steering shaft, shaft joint and then to the pinion.
Since the pinion teeth mesh with teeth on rack, the motion is further transferred to the rack and changed to linear motion. The force is then transmitted through the tie rods to the steering knuckles which turn wheels.

ON-VEHICLE SERVICE

LUBRICATION

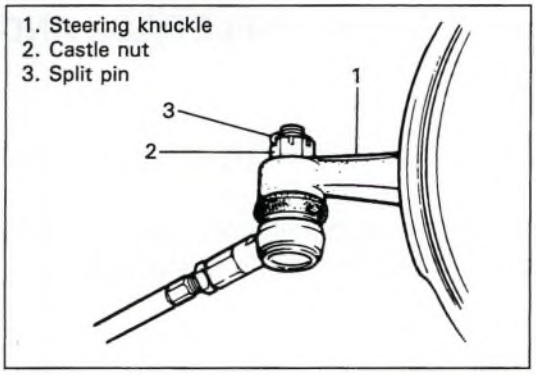
When inner parts of the steering gear case were disassembled, they should be washed clean before reassembly. It is recommended to use the grease as given at the right where grease application is indicated in the text.

*SUZUKI SUPER GREASE (E) 99000-25050, or Lithium grease (applicable for −40°C ~ 130°C)



1. Snap ring
2. Steering gear case oil seal
3. Pinion bearing plug
4. Steering pinion
5. Steering pinion needle bearing
6. Rack damper screw cap
7. Rack damper screw
8. Rack plunger spring
9. Steering rack plunger
10. Steering rack housing & gear case
11. Tie-rod end
12. Tie-rod end lock nut
13. Rack boot clip
14. Boot
15. Wire
16. Steering tie-rod
17. Tie-rod lock washer
18. Steering rack bushing
19. Steering rack side mount
20. Steering rack
21. Steering pinion side mount
22. Gear case seal

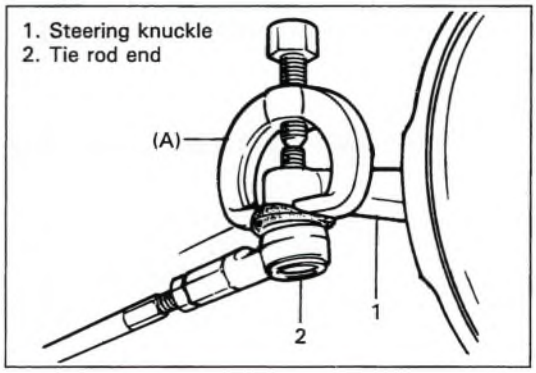
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1. REMOVE AND INSTALL MANUAL RACK AND PINION ASSEMBLY (STEERING GEAR CASE)

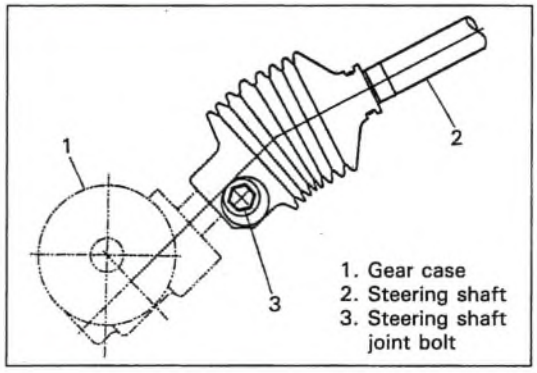
REMOVAL

1) Hoist vehicle and remove both wheels.
2) Remove split pins and tie rod castle nuts from both knuckles.



3) Disconnect both tie rod ends from knuckles, using special tool (A).

Special Tool
(A): 09913-65210

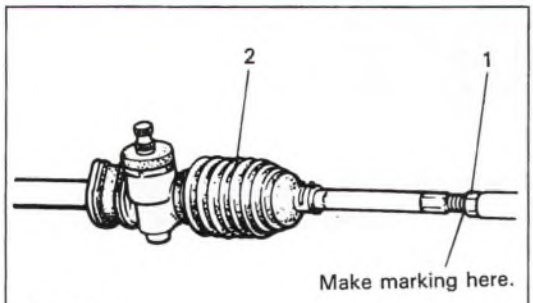


4) Remove front under cover.
5) Remove steering shaft joint bolt and disconnect joint from pinion.
6) Remove steering gear case mount bolts, gear case brackets and then gear case.

INSTALLATION

Reverse removal procedure for installation.

Tightening Torque
Gear case mount bolt:
20—30 N·m (2.0—3.0 kg-m)
Tie rod end castle nut:
30—55 N·m (3.0—5.5 kg-m)
Joint bolt:
20—30 N·m (2.0—3.0 kg-m)
Tie rod end lock nut:
35—55 N·m (3.5—5.5 kg-m)



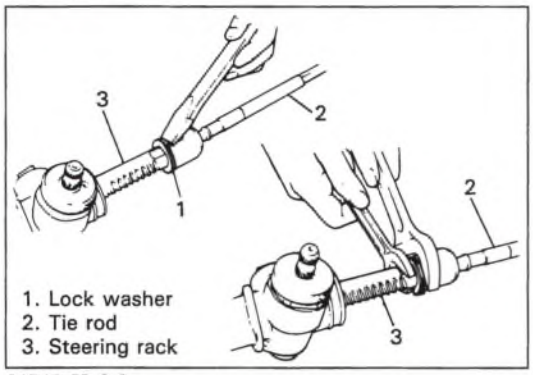
1. Lock nut
2. Boot

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2. DISASSEMBLE AND ASSEMBLE RACK AND PINION ASSEMBLY

DISASSEMBLY

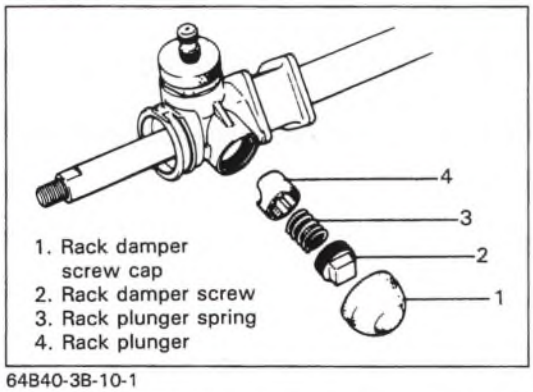
1) Remove steering gear case by referring to case removal section.
2) For ease of adjustment after installation, make marking of tie rod end lock nut position of tie rod thread.



1. Lock washer
2. Tie rod
3. Steering rack

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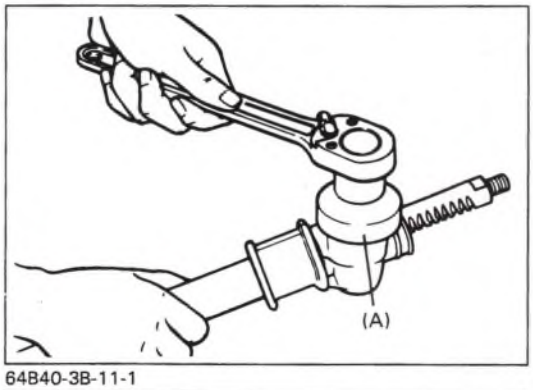
3) Loosen tie rod end lock nut and remove tie rod end.
4) Remove boot wire and clip.
5) Remove boot from tie rod.
6) Unbend bent part of tie rod lock washer and remove tie rod from rack.



1. Rack damper screw cap
2. Rack damper screw
3. Rack plunger spring
4. Rack plunger

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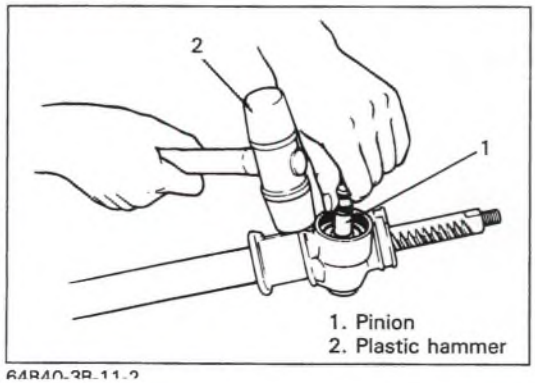
7) Remove parts as shown.



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8) Remove bearing plug with special tool (A).

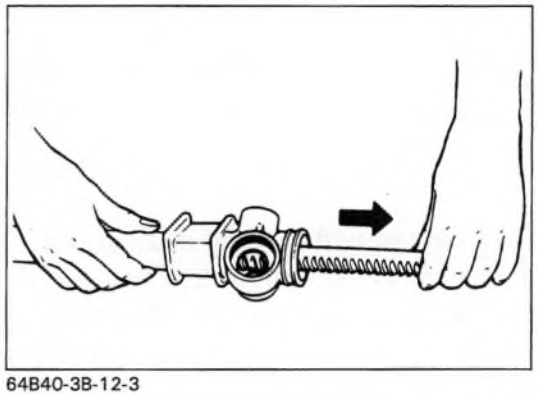
Special Tool (43 mm socket)
(A): 09944-28211



1. Pinion
2. Plastic hammer

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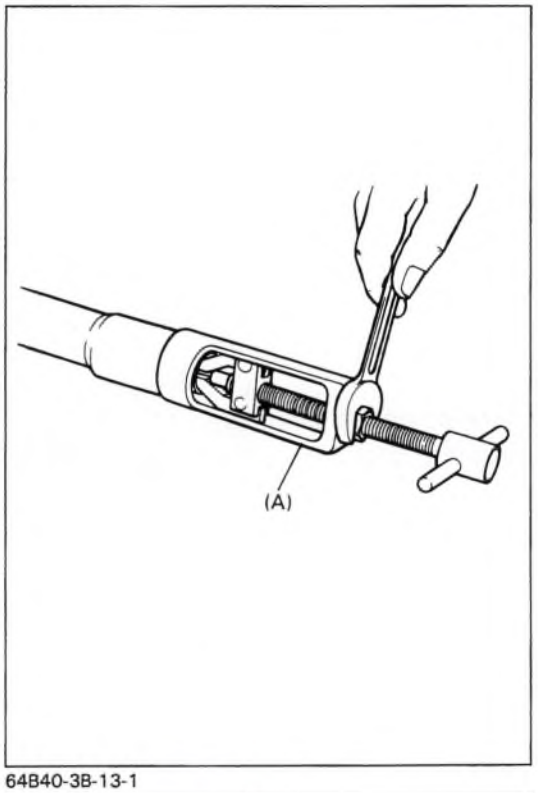
9) Tap on position as shown with plastic hammer to separate pinion assembly from housing.
10) Remove pinion assembly.



64B40-3B-12-3

11) Remove rack from gear case. Direction for rack removal is as shown.

CAUTION:
Inside of steering rack bushing is coated with special coating. As it is damageable, be very careful not to cause damage to it when removing rack from steering gear case.

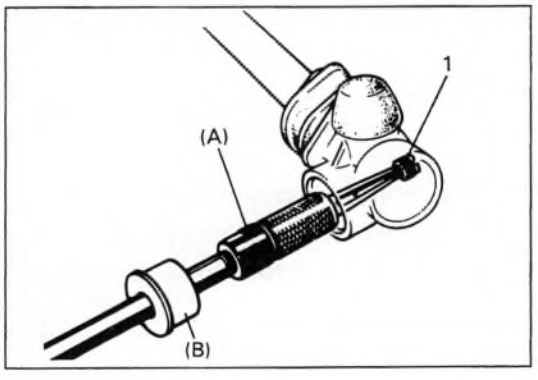


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12) Remove snap ring.
13) Pull out bushing from rack housing with special tool (A) as shown.

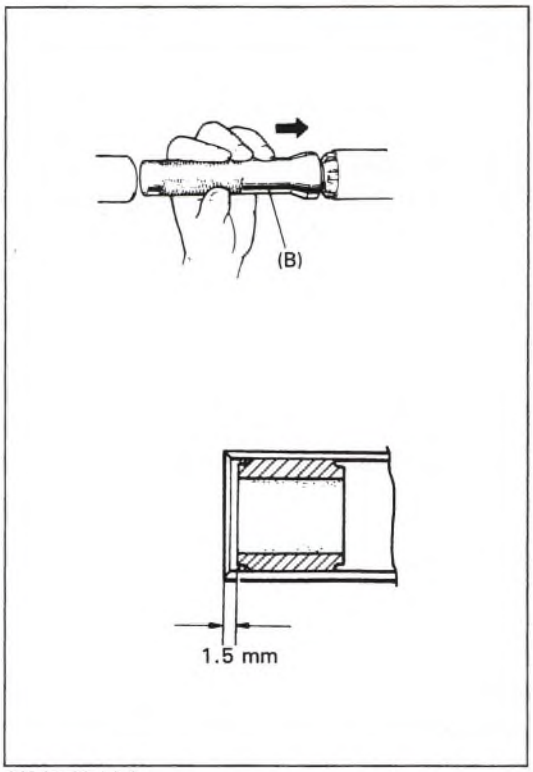
Special Tool
(A): 09944-48210

NOTE:
When removing rack bushing, be careful not to pull out bushing by holding gear case in a vise. Or housing (pipe) may come off gear case. For this work, be sure to use the specified special tool.



14) Pull out pinion bearing from gear case with special tools (A) and (B) as shown.

Special Tools
(A): 09921-20200
(B): 09930-30102



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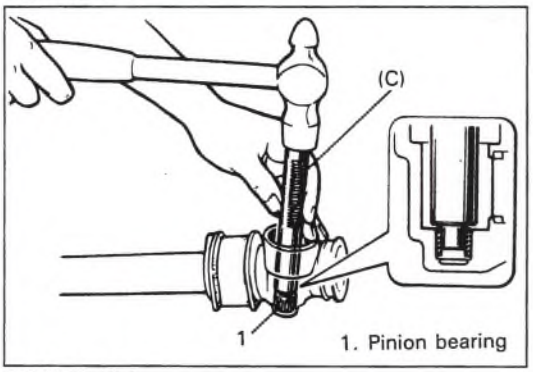
ASSEMBLY

1) Apply grease lightly to entire inner surface of bushing.
2) Press-fit bushing as far into rack housing as shown by using special tool (B).

CAUTION:
Inside of bushing is coated with special coating. As it is damageable, be sure to use special tool and special care not to cause damage to inside of bushing when press-fitting it.

Special Tool
(B): 09943-78210

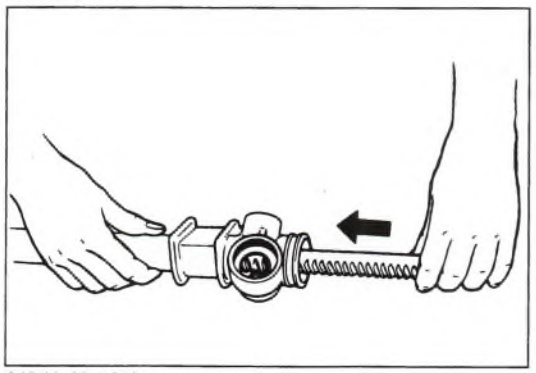
3) Install snap ring.



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4) Apply grease to rollers of pinion bearing.
Press-fit pinion bearing into gear case with special tool (C) as shown.
After press-fitting, make sure that bearing rollers are installed properly.

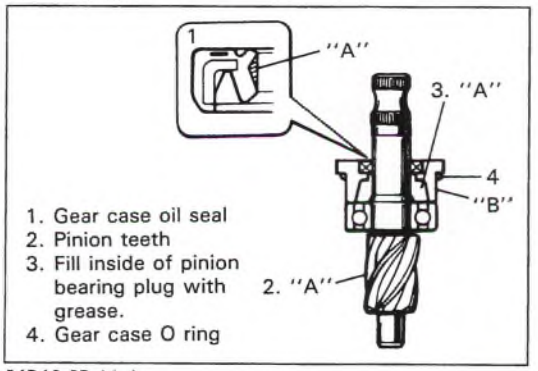
Special Tool
(C): 09943-88211



64B40-3B-12-4

5) Apply grease to entire teeth surface of rack and its periphery.
6) Slide rack into steering gear case in the direction as shown.

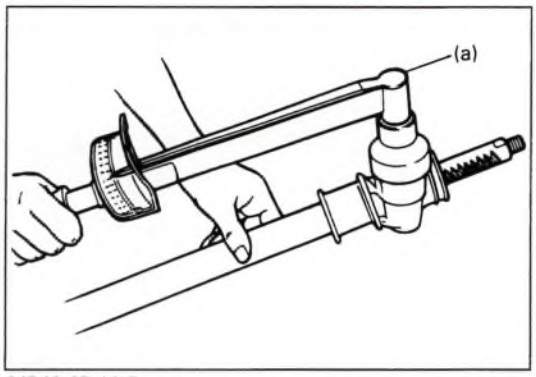
CAUTION:
Inside of steering rack bushing is coated with special coating. As it is damageable, be very careful not to cause damage to it when inserting rack into steering gear case.



64B40-3B-11-4

7) Apply grease to all around pinion teeth, pinion needle bearing and gear case oil seal lip.

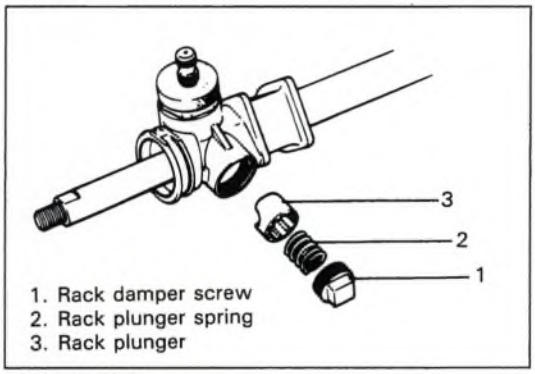
"A": Grease 99000-25050
"B": Lock Cement 99000-32040



64B40-3B-11-5

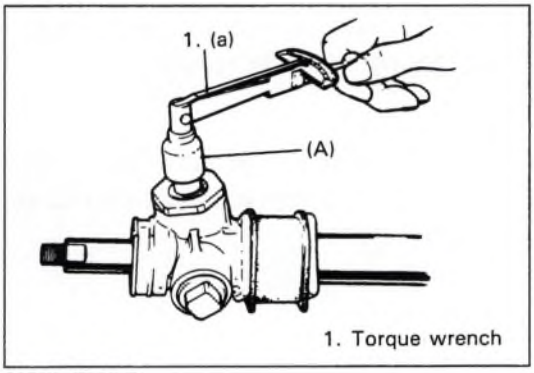
8) Install pinion assembly.
9) Tighten pinion bearing plug to specified torque.

Tightening Torque
(a): 80—110 N·m (8.0—11.0 kg-m)



64B40-3B-10-3

10) Apply grease lightly to sliding part of plunger against rack.
11) Install parts as shown.



64B40-3B-10-4

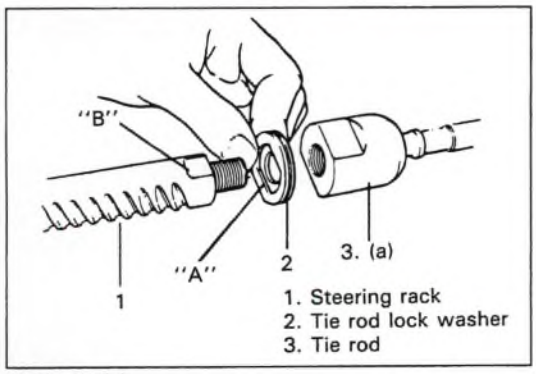
12) After tightening rack damper screw to the tightest point, turn it back by 0—90° and check for rotation torque of pinion.

Special Tool
(A): 09944-18211

Rotation Torquer of pinion
(a): 0.8—1.3 N·m (0.08—0.13 kg-m)

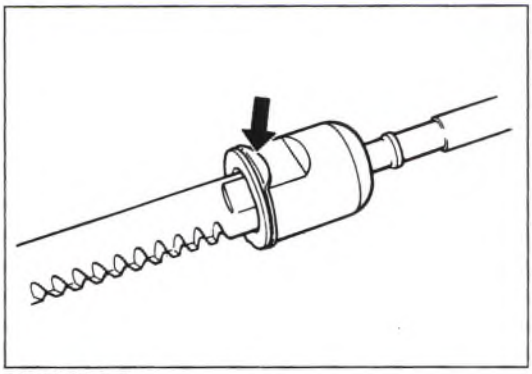
Also, check if rack as a whole moves smoothly.

13) After adjustment, put rack damper screw cap as deeply as possible.



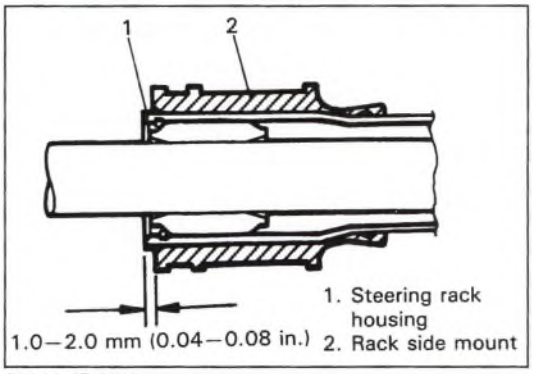
14) Install tie rod lock washer and tie rod to rack. Align straight part "A" of washer with flat part "B" of rack.
15) Tighten tie rod inside ball nut to specified torque.

Tightening Torque
(a): 70—100 N·m (7.0—10.0 kg-m)



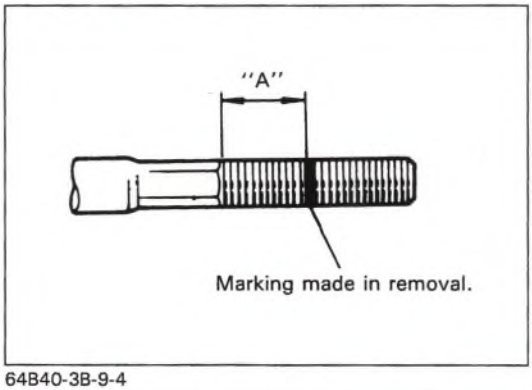
64B40-3B-9-2

16) Bend lock washer to tie rod side as shown.



64B40-3B-13-1

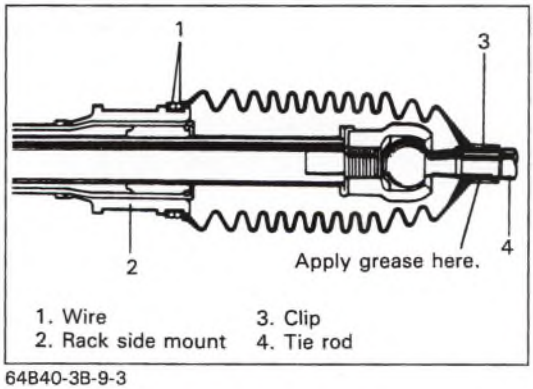
17) Before installing boot to steering rack housing, make sure that rack side mount is positioned as shown.



64B40-3B-9-4

18) Install tie rod end lock nut and tie rod end to tie rod. Position lock nut to marking made in removal.

NOTE:
When tie rod was replaced, measure length "A" on removed tie rod and use it on new replacement tie rod so as to position lock nut properly.



64B40-3B-9-3

19) Position boot properly in grooves of gear case and tie rod and clamp it with wire and clip.
Wire should be new and should go around twice and be tightened with its both ends twisted together. The twisted ends should be bent in the circumferential direction. After this, check to ensure that boot is free from twist and dent.

20) Install steering gear case referring to INSTALLATION of STEERING GEAR CASE previously.

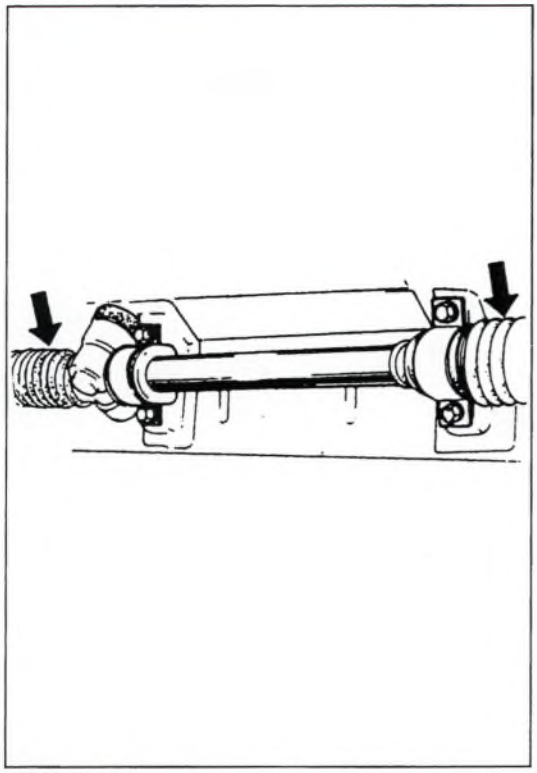
RACK AND PINION INSPECTION

STEERING RACK BOOT

Hoist vehicle.

Inspect each boot for tear. A torn boot allows entry of dust and water which can cause wear to steering rack and pinion to produce noise as well as rust to result in malfunction of steering system.
If even a small tear is noted, replace with new one.

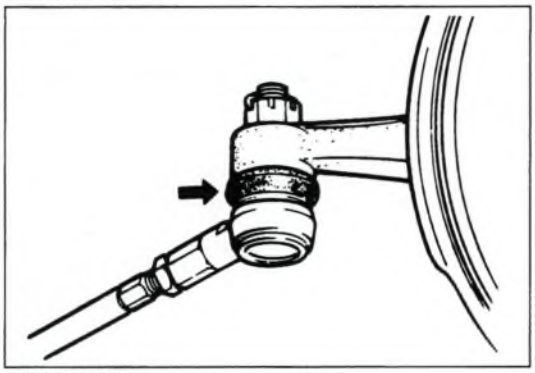
Boots should be visually inspected for any damage and tear during every periodical inspection at specified intervals and whenever vehicle is hoisted for any other purpose.



64B40-3B-15-1

TIE ROD END BOOTS

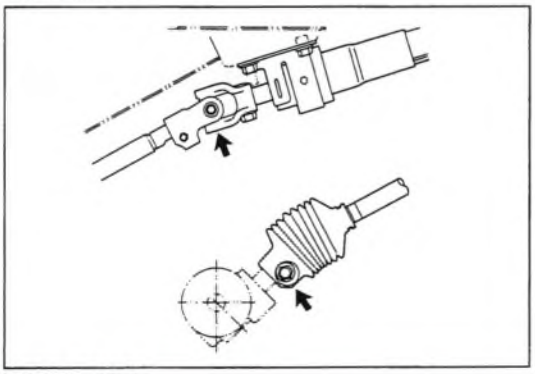
Inspect each boot for tear. If even a small tear is noted, replace with new one.



64B40-3B-15-3

STEERING SHAFT JOINT

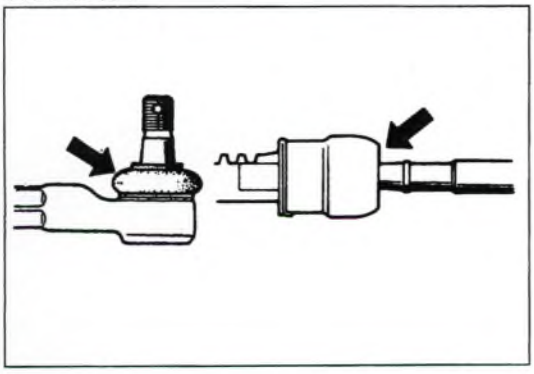
Check shaft joint for wear, breakage and other damage and replace if any defect exists.

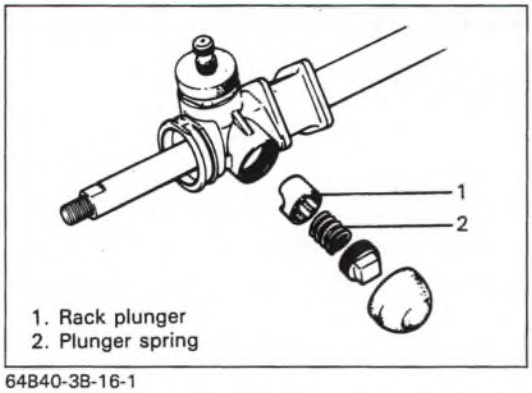


64B40-3B-15-4

TIE ROD END

1) Inspect for play in ball joint.
2) Inspect for plaly in rack end ball joint.
 In either case, if found defective, replace.



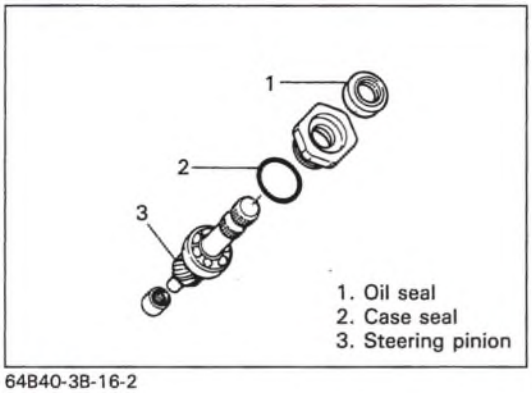


1. Rack plunger
2. Plunger spring

64B40-3B-16-1

RACK PLUNGER

1) Inspect rack plunger for wear or damage.
2) Inspect rack plunger spring for deterioration.
 In either case, if found defective, replace.



1. Oil seal
2. Case seal
3. Steering pinion

64B40-3B-16-2

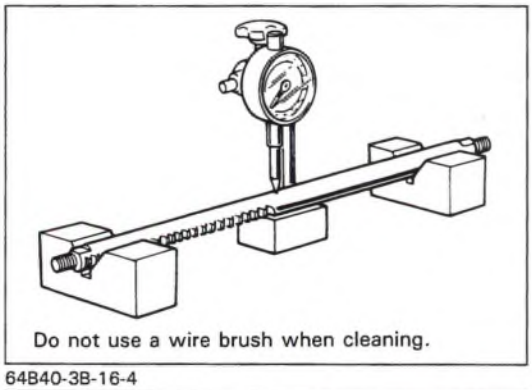
STEERING PINION

1) Inspect pinion teeth surface for wear or damage.
2) Inspect oil seal for damage.
3) Inspect gear case packing for damage.
 Replace any part found defective.

STEERING PINION BEARING

Check rotation condition of bearing and inspect for wear.
If found defective, replace.

64B40-3B-16-3



Do not use a wire brush when cleaning.

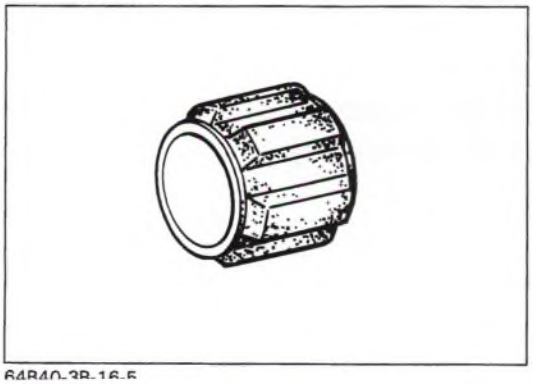
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STEERING RACK

Inspect for deflection, teeth wear, or damage, back surface wear or damage.

Limit of rack deflection: 0.40 mm

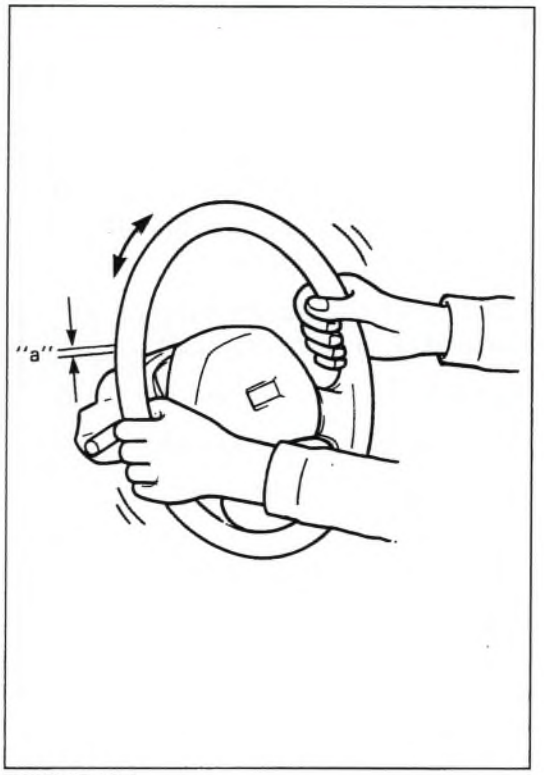
If deflection exceeds limit, replace rack.



64B40-3B-16-5

STEERING RACK BUSHING

Inspect rack bushing for wear or damage.
If found defective, replace.



64B40-3B-17-1

STEERING WHEEL

Check steering wheel for play and rattle, holding car in straight forward condition on the ground.

Steering wheel play "a": 0—30 mm

If steering wheel play is not within specification, inspect as follows and replace if found defective.

- Tie-rod end ball stud for wear (ball stud should move when more than 2 kg-cm torque is applied.)
- Lower ball joint for wear
- Steering shaft joint for wear
- Steering pinion or rack gear for wear or breakage
- Each part for looseness

RECOMMENDED TORQUE SPECIFICATIONS

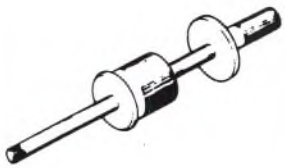
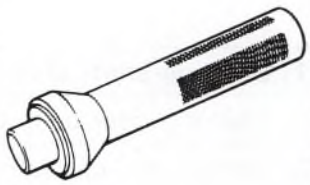
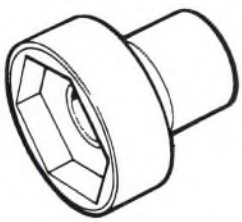
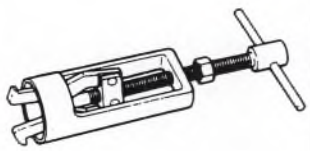
Fastening parts	Tightening torque	
	N·m	kg-m
1. Steering shaft joint bolts	20—30	2.0—3.0
2. Steering gear case bolts	20—30	2.0—3.0
3. Tie-rod end castle nuts	30—55	3.0—5.5
4. Tie-rod end lock nuts	35—55	3.5—5.5
5. Steering pinion bearing plug	80—110	8.0—11.0
6. Tie-rod	70—100	7.0—10.0
7. Wheel nut	50—80	5.0—8.0

REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium Grease (Should be applicable for −40°C ~ 130°C)	SUZUKI SUPER GREASE (E) (99000-25050)	• Sliding part of rack against steering housing (All around rack plunger, rack bushing and rack) • Sliding part against steering pinion (Oil seal lip, needle bearing) • Steering rack and pinion gear teeth • Filled into pinion bearing cap • Contacting parts of tie-rod and rack side boots • Rack end ball joint
Lock cement	THREAD LOCK CEMENT 1401 (99000-32040)	• Pinion gear case

64B40-3B-18-1

SPECIAL TOOLS

 09913-65210 Tie-rod end remover	 09921-20200 Pinion bearing remover	 09930-30102 Sliding shaft	 09943-78210 Rack bush installer
 09943-88211 Pinion bearing installer	 09944-18211 Pinion torque checking socket	 09944-28211 43 mm Socket (Pinion bearing plug remover)	 09944-48210 Rack bush remover

64B40-3B-18-2

SECTION 3C

STEERING WHEEL AND COLUMN

NOTE:
All steering wheel and column fasteners are important parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality of substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.

64B40-3C-1-1

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ON-VEHICLE SERVICE 3C-3
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2. Remove and Install Combination Switch 3C-3
3. Remove and Install Steering Column 3C-4
4. Remove and Install Steering Lock 3C-6
5. Checking Steering Column for Accident Damage 3C-7

RECOMMENDED TORQUE SPECIFICATIONS 3C-8
SPECIAL TOOL 3C-8

64B40-3C-1-2

GENERAL DESCRIPTION

The double tube type steering column with ball bearing included following three important features in addition to the steering function:

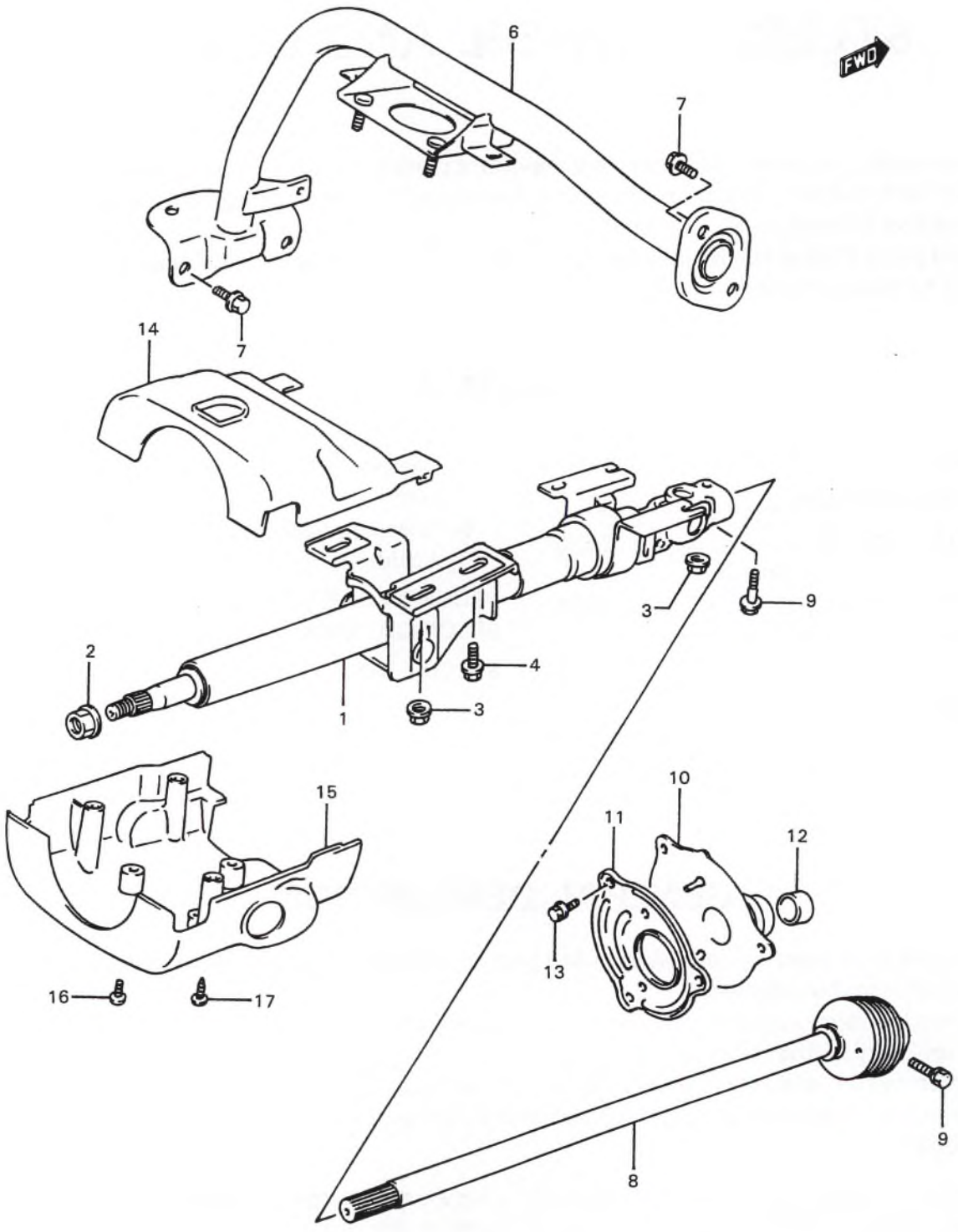
1. The column is energy absorbing, designed to compress in a front-end collision to minimize the possibility of an injury to the driver of the vehicle.
2. The ignition switch and lock are mounted conveniently on this column.
3. With the column mounted lock, the ignition and steering operations can be locked to inhibit theft of the vehicle.

This column may be easily removed and installed. To insure the energy absorbing action, it is important that only the specified screws, bolts, and nuts be used as designated and that they are tightened to the specified torque.

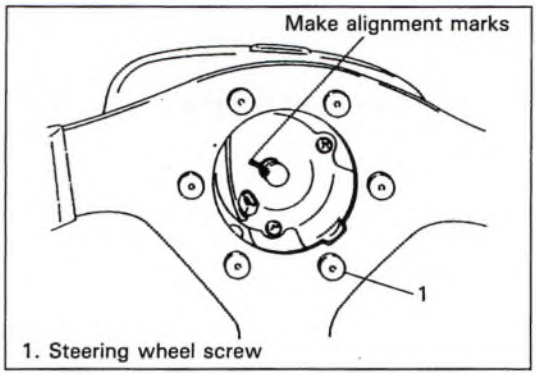
When the column assembly is removed from the vehicle, special care must be taken in handling it. Use of a steering wheel hub remover other than the one recommended in this manual or a sharp blow on the end of the steering shaft, leaning on the assembly, or dropping the assembly could shear the plastic shear pins which maintain column length.

64B40-3C-1-3

STEERING COLUMN ASSEMBLY



1. Steering column assembly
2. Steering shaft nut
3. Steering column mounting nut
4. Steering column mounting bolt
5. Blank
6. Steering support member
7. Steering support member mounting bolt
8. Steering lower shaft
9. Steering shaft joint bolt
10. Steering middle shaft boot
11. Steering middle shaft boot plate
12. Steering middle shaft boot bush
13. Steering middle shaft boot bolt
14. Steering column upper cover
15. Steering column lower cover
16. Steering column cover screw
17. Steering column cover tapping screw



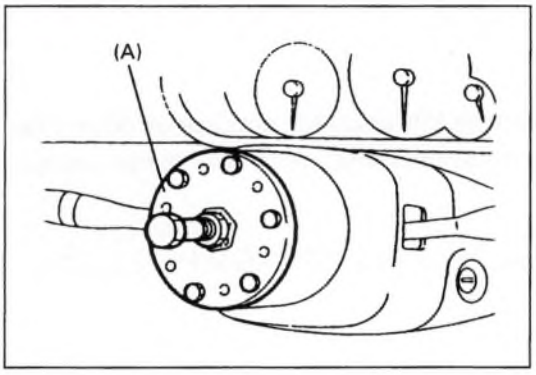
1. Steering wheel screw

ON-VEHICLE SERVICE

1. REMOVE AND INSTALL STEERING WHEEL AND HUB

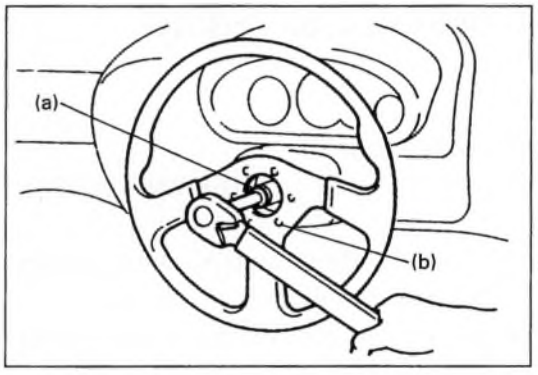
REMOVAL

1) Disconnect negative battery cable.
2) Remove steering wheel pad and horn button.
3) Remove steering shaft nut.
4) Make alignment marks on steering wheel hub and shaft for a guide during reinstallation.



5) Remove steering wheel.
6) Remove steering wheel hub with special tool (A).

Special Tool
(A): 09944-36020



INSTALLATION

Reverse removal procedure for installation.
Be sure to use new steering wheel screws.

Tightening Torque
(a): 25—40 N·m (2.5—4.0 kg-m)
(b): 3—4 N·m (0.2—0.4 kg-m)

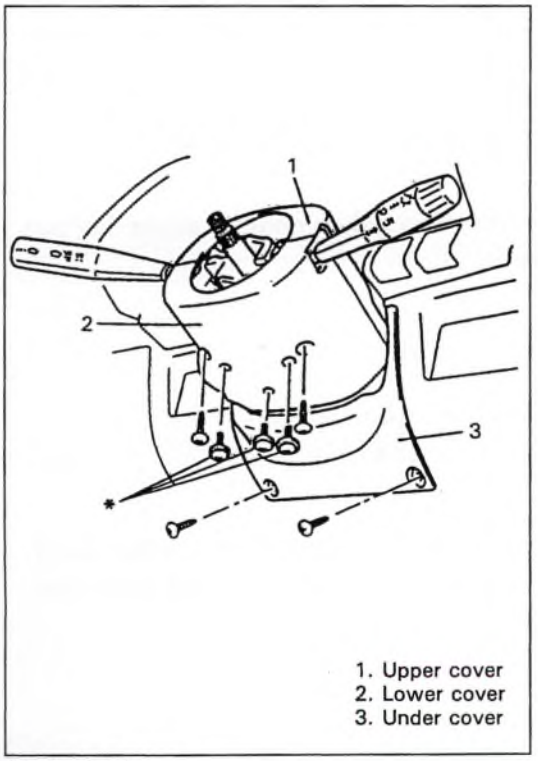
NOTE:
Never reuse steering wheel screws.

2. REMOVE AND INSTALL COMBINATION SWITCH

REMOVAL

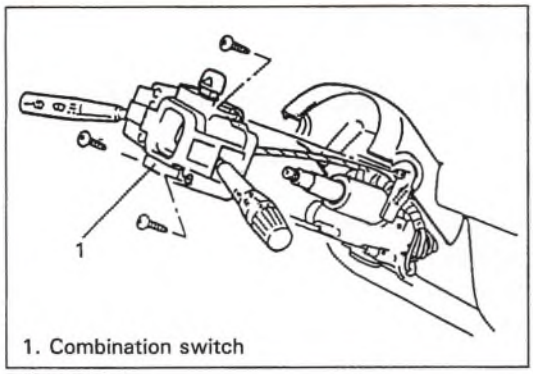
1) Disconnect negative battery cable.
2) Before removing this switch, remove steering wheel hub. Refer to STEERING WHEEL REMOVAL.
3) Remove column covers (under and lower).

NOTE:
Marked with * are standard screws.
The rest are tapping screws.



1. Upper cover
2. Lower cover
3. Under cover

4) Disconnect lead wire from combination switch at coupler.
5) Loosen wire bands.
6) Remove combination switch assembly from steering column.



1. Combination switch

64B40-3C-5-1

INSTALLATION

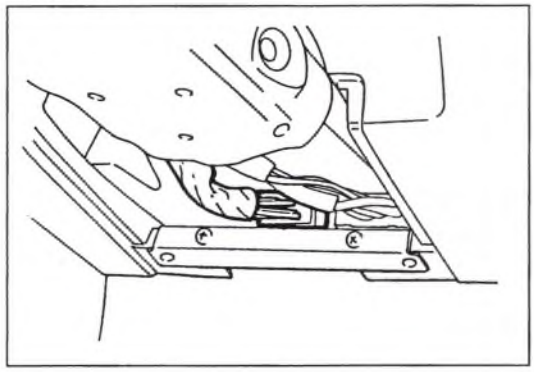
1) Install combination switch.
2) Connect lead wire of this switch at coupler.
3) Tighten wire bands.

4) Install column lower cover and under cover.

NOTE:
When tightening torque lower cover and upper cover, be careful so that combination switch lead wire is not caught between covers.

5) Install steering wheel. Refer to STEERING WHEEL INSTALLATION.

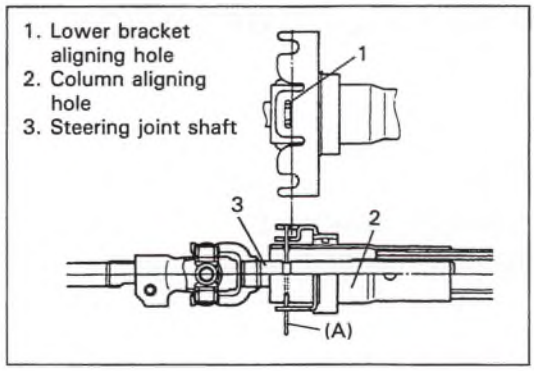
64B40-3C-5-2



3. REMOVE AND INSTALL STEERING COLUMN

REMOVAL

1) Disconnect negative battery cable.
2) Remove steering wheel hub. Refer to STEERING WHEEL HUB REMOVAL.
3) Disconnect lead wires from ignition switch, combination switch and ignition key warning switch at coupler.
4) Remove combination switch. Refer to Steps 3) through 6) under COMBINATION SWITCH REMOVAL.

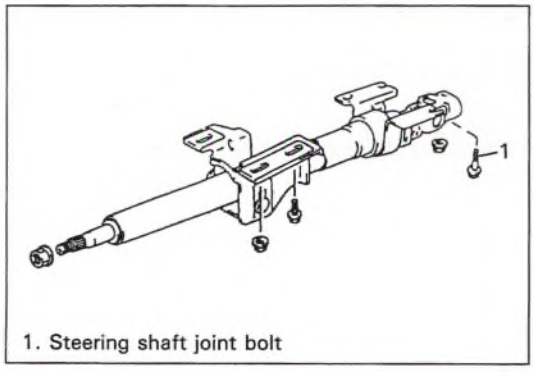


1. Lower bracket aligning hole
2. Column aligning hole
3. Steering joint shaft

5) Set telescopic and tilt lever to OFF position
6) Using special tool, position lower bracket, column and steering shaft for easier adjustment at installation.
7) Set telescopic and tilt lever to LOCK position.

NOTE:
Special tool should not be removed till column assembly has been installed to chassis.

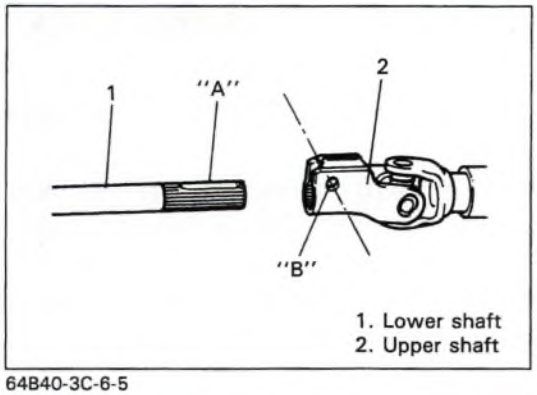
Special Tool
(A): 09942-87011



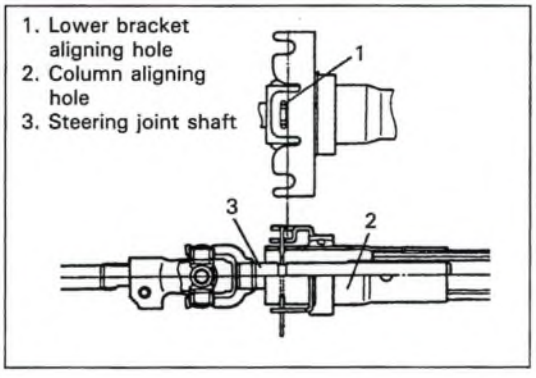
1. Steering shaft joint bolt

8) Remove steering shaft joint bolt.
9) Remove steering column assembly.

NOTE:
Don't disassemble steering column assembly into column and shaft. If steering column or shaft is found defective, replace as an assembly. See p. 3C-7.



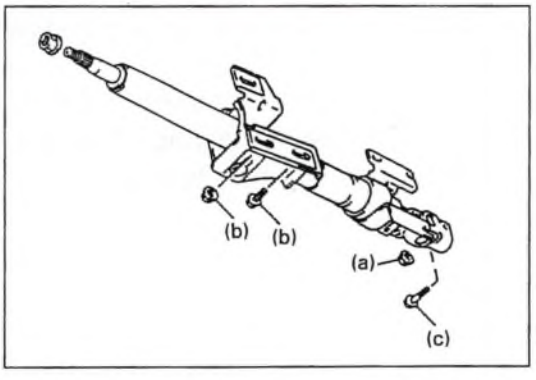
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INSTALLATION

Reverse removal procedure for installation, noting following points.

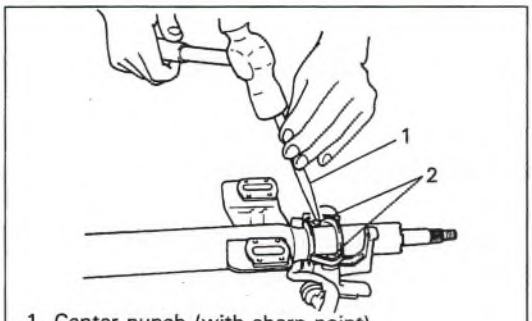
- Do not remove special tool before completion of column assembly installation and be sure to remove it upon completion of installation.
- Also, do not set telescopic and tilt lever to OFF position before completion of column assembly installation.
- Align flat part "A" of lower shaft with bolt hole "B" of upper side joint as shown. Then insert upper side joint into lower shaft.



- Tighten bolts and nuts to specified torque in alphabetical order as indicated in figure at the left.

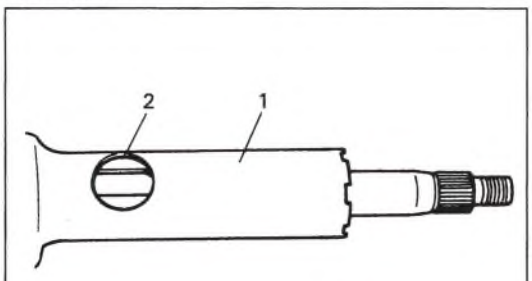
Tightening Torque

(a): 11—17 N·m (1.1—1.7 kg-m)
(b): 11—17 N·m (1.1—1.7 kg-m)
(c): 20—30 N·m (2.0—3.0 kg-m)



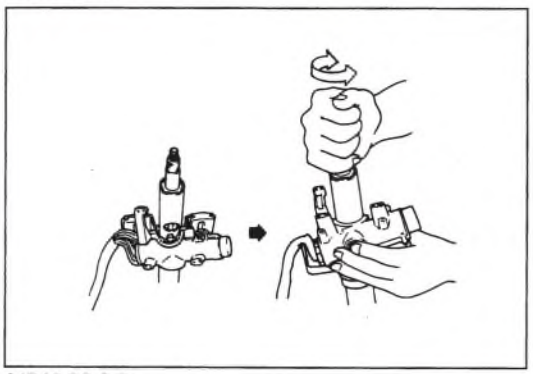
1. Center punch (with sharp point)
2. Steering lock mounting bolts

64B40-3C-7-5

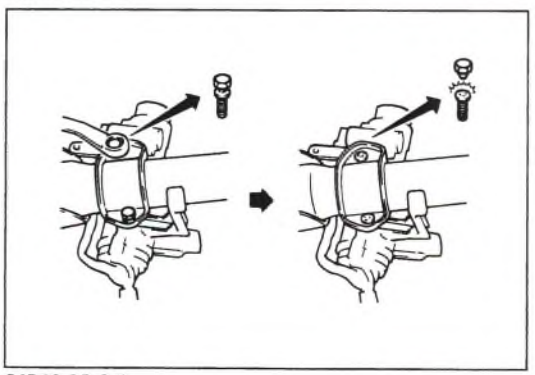


1. Steering column
2. Steering shaft

64B40-3C-8-2



64B40-3C-8-3



64B40-3C-8-4

4. REMOVE AND INSTALL STEERING LOCK

REMOVAL

1) Remove steering column. Refer to STEERING COLUMN REMOVAL.
2) Using center punch as shown, loosen and remove steering lock mounting bolts. Use care not to damage aluminum part of steering lock body with center punch.
3) Turn ignition key to "ACC" or "ON" position and remove steering lock assembly from steering column.

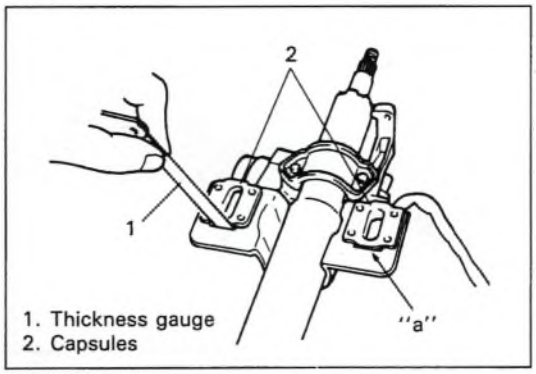
INSTALLATION

1) Position oblong hole of steering shaft in the center of hole in column.
2) Turn ignition key to "ACC" or "ON" position and install steering lock assembly onto column.
3) Now turn ignition key to "LOCK" position and pull it out.
4) Align hub on lock with oblong hole of steering shaft and rotate shaft to assure that steering shaft is locked.
5) Tighten two new bolts until head of each bolt is broken off.
6) Turn ignition key to "ACC" or "ON" position and check to be sure that steering shaft rotates smoothly. Also check for lock operation.
7) Install steering column. Refer to STEERING COLUMN INSTALLATION.

5. CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

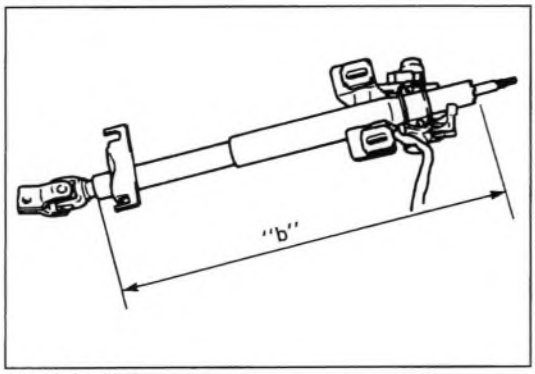
NOTE:
Vehicles involved in accidents resulting in body damage or where the steering column has been impacted may also have a damaged or misaligned steering column.

64B40-3C-10-1

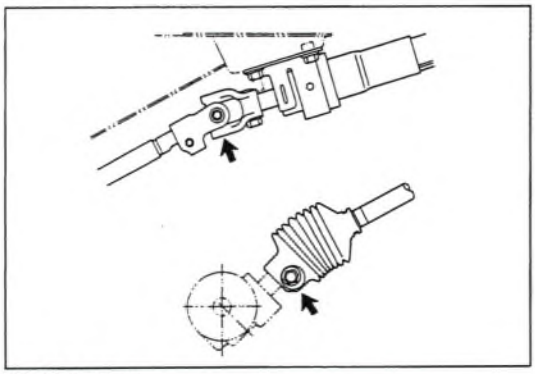


1. Thickness gauge
2. Capsules

64B40-3C-10-2



64B40-3C-10-3



64B40-3C-10-4

CHECKING PROCEDURE

1) Check capsuled on steering column bracket; all should be contacting the bottom of slots.
 If not, steering column assembly should be replaced. Use thickness gauge for convenience.

 Clearance "a": 0 mm

 NOTE:
 Each capsule should be contacting the bottom of the slot. If not, replace column assembly.

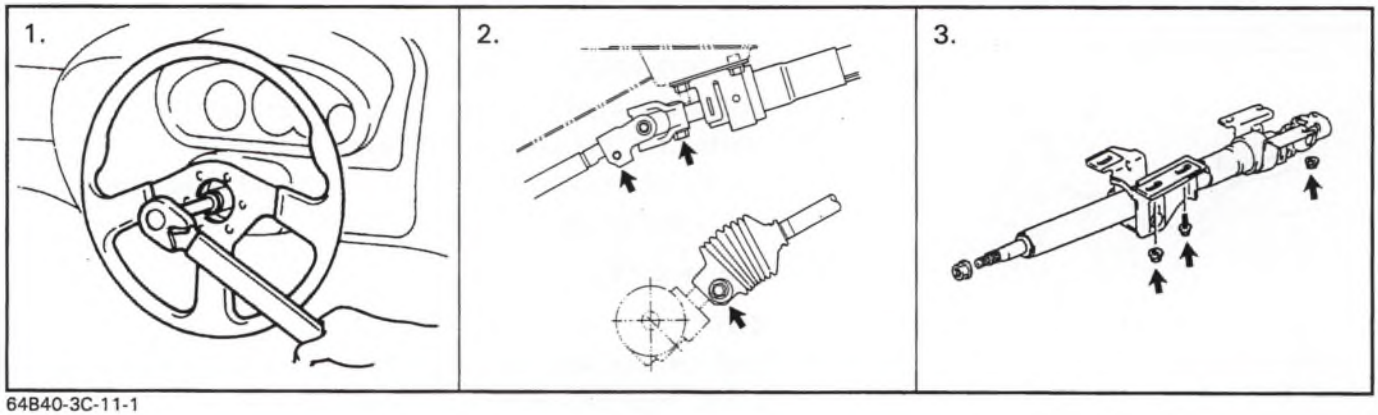
2) Take measurement "b" as shown. If it is shorter than specified length, replace column assembly with new one.

 Length "b": 428 mm

3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play. If anything is found faulty, replace as joint assembly.
4) Check steering shaft for smooth rotation. If found defective, replace as column assembly.
5) Check steering shaft and column for bend, cracks or deformation. If found defective, replace.

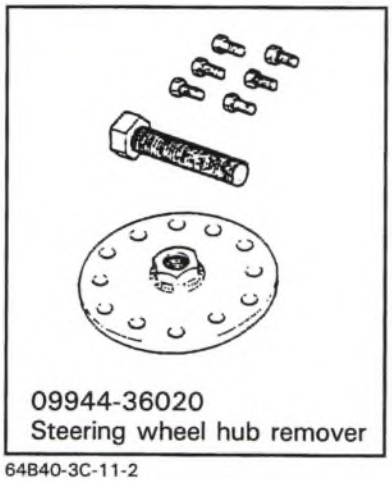
RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque	
	N·m	kg-m
1. Steering shaft nut	25—40	2.5—4.0
2. Steering shaft joint bolts	20—30	2.0—3.0
3. Steering column nuts	11—17	1.1—1.7



64B40-3C-11-1

SPECIAL TOOL



09944-36020
Steering wheel hub remover

64B40-3C-11-2

SECTION 3D

FRONT SUSPENSION

NOTE:

- **All front suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes nacessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.**
- **Never attempt to heat, quench or straighten any front suspension part. Replace it with a new part or damage to the part may result.**

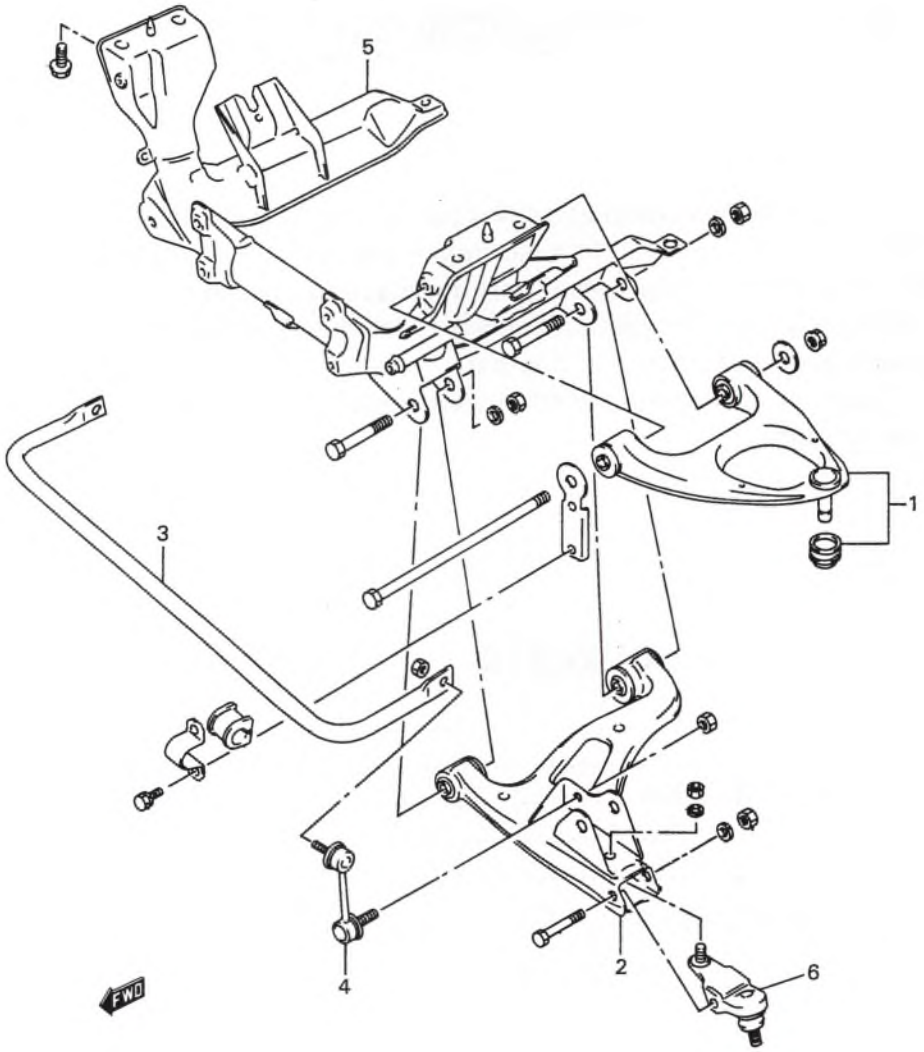
64B40-3D-1-1

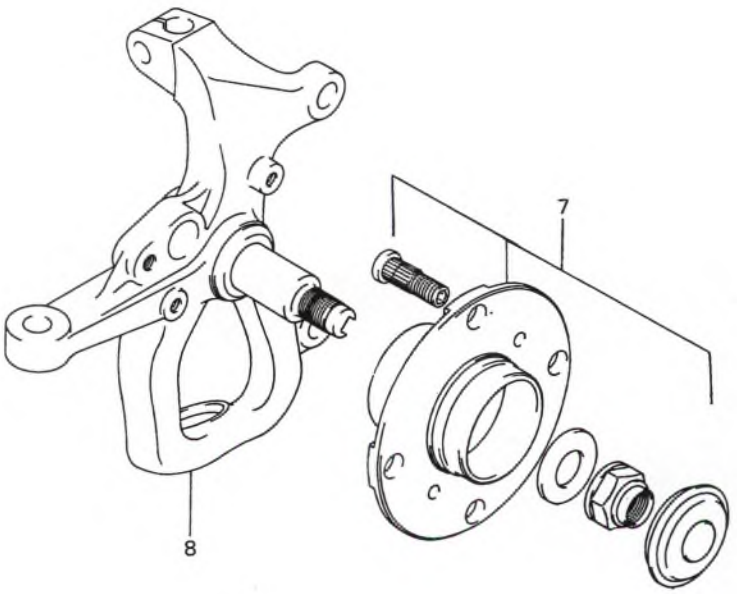
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Inspection 3D- 6
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RECOMMENDED TORQUE SPECIFICATIONS 3D-10
SPECIAL TOOLS 3D-10

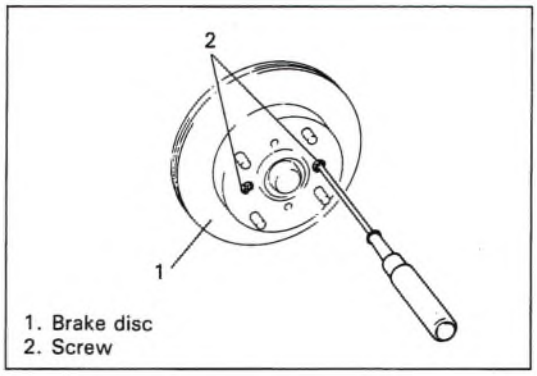
64B40-3D-1-2

ON-VEHICLE SERVICE





1. Upper arm
2. Lower arm
3. Stabilizer bar
4. Stabilizer bar joint
5. Front suspension frame
6. Lower arm joint
7. Wheel hub assembly
8. Steering knuckle

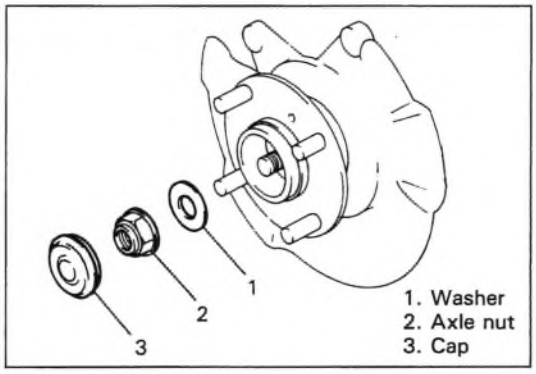


1. Brake disc
2. Screw

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove caliper from caliper carrier.
3) Remove brake disc screws (2 pcs).

NOTE:
Refer to FRONT BRAKE R & I of SECTION 5.

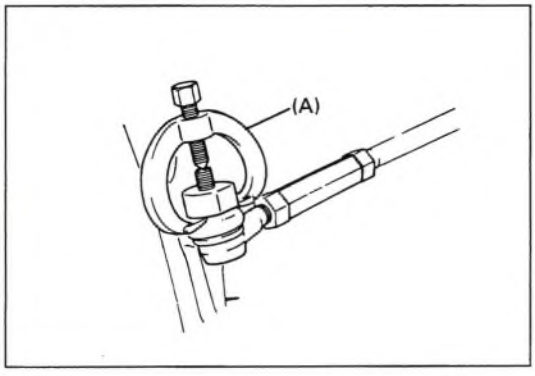


1. Washer
2. Axle nut
3. Cap

4) Uncalk axle nut and remove axle nut and washer.
5) Remove wheel hub assembly by using special tools.

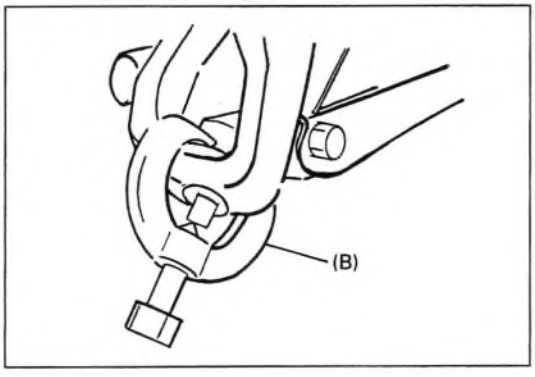
Special Tools
09943-17911 (Brake drum remover)
09942-15510 (Sliding hammer)

6) Remove dust cover.



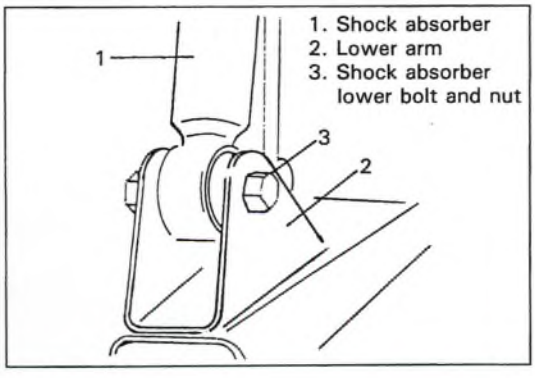
7) Remove split pin and castle nut, disconnect tie rod end from knuckle by using special tool (A).

(A): 09913-65210



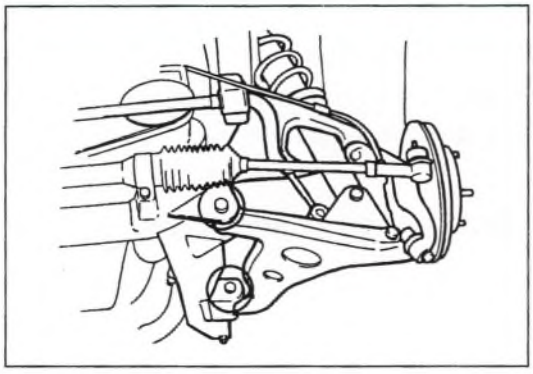
8) Remove bolt, split pin and castle nut, remove steering knuckle by using special tool (B).

Special Tool
(B): 09913-65230

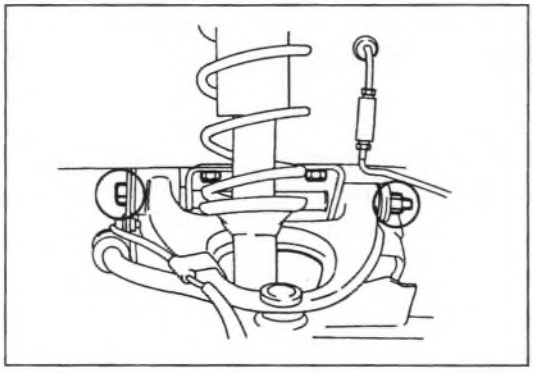


1. Shock absorber
2. Lower arm
3. Shock absorber lower bolt and nut

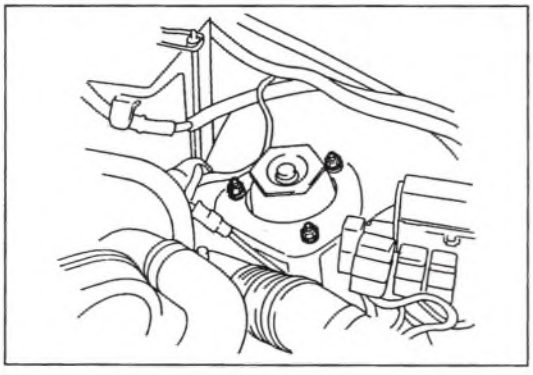
9) Remove shock absorber lower bolt and nut.
10) Remove front stabilizer joint lock nut and remove front stabilizer bar link joint from front suspension lower arm.



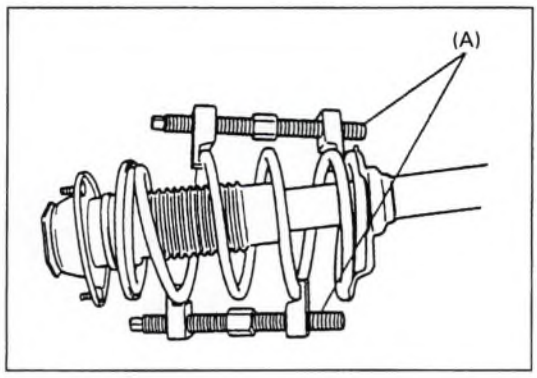
11) Remove front suspension lower arm.



12) Remove under cover mounting bolt and move under cover out of place.
13) Remove front suspension upper arm.



14) Remove front shock absorber support nuts. Hold shock absorber by hand so that it will not fall off.
15) Remove front shock absorber assembly.

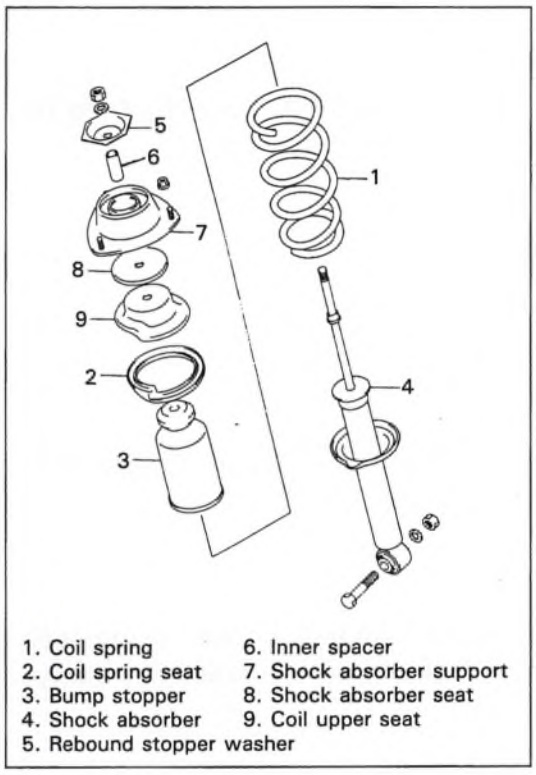


ASSEMBLE AND DISASSEMBLE SHOCK ABSORBER

DISASSEMBLY

1) With special tool (A) placed to spring as shown, turn special tool bolts alternately until spring tension is released. Whether it is released or not can be known by whether shock absorber turns lightly while spring is held stationary.

Special Tool
(A): 09940-71430



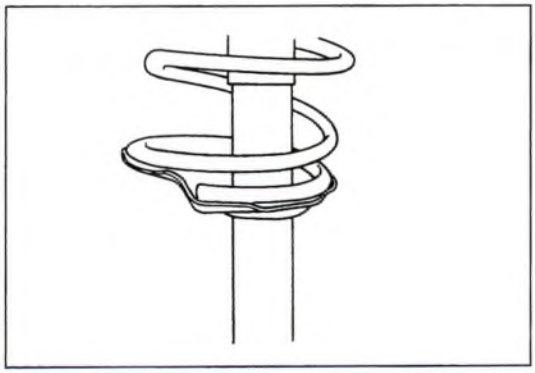
1. Coil spring
2. Coil spring seat
3. Bump stopper
4. Shock absorber
5. Rebound stopper washer
6. Inner spacer
7. Shock absorber support
8. Shock absorber seat
9. Coil upper seat

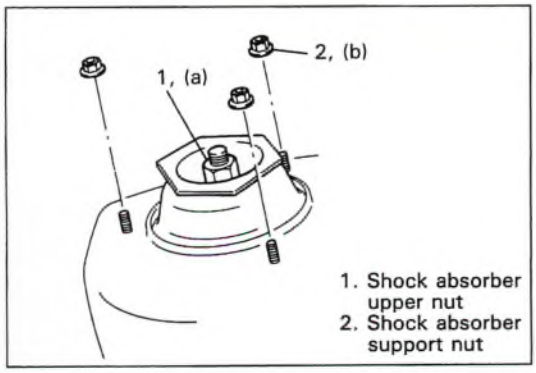
2) While keeping spring compressed with special tool as shown in above figure, remove shock absorber upper nut and then disassemble parts.

ASSEMBLY

Reverse disassembly procedure for assembly, noting the following.

- Install spring with large diameter side facing up and small diameter side down.
- Mate spring end with stepped part of lower seat as shown.

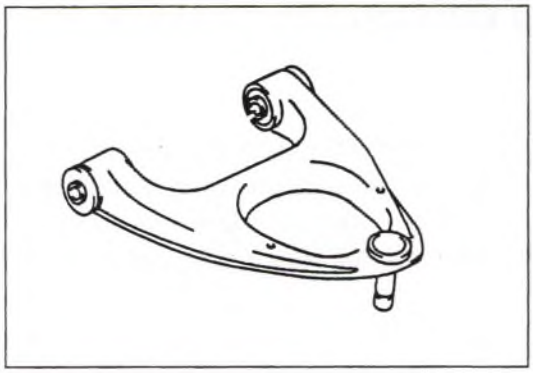




1. Shock absorber upper nut
2. Shock absorber support nut

- Tighten shock absorber upper nut and shock absorber support nuts to specified torque.

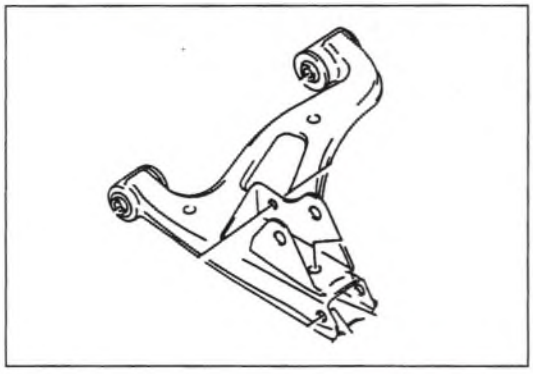
Tightening Torque
(a): 40—60 N·m (4.0—6.0 kg-m)
(b): 21—33 N·m (2.1—3.3 kg-m)



INSPECTION

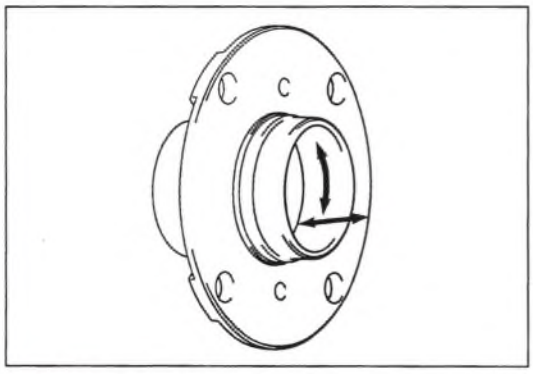
UPPER ARM

- Inspect rubber bushing for deterioration.
- Inspect for cracks or deformation.
- If defective, replace.



LOWER ARM

- Inspect rubber bushing for deterioration.
- Inspect strut, stabilizer and their installation sections for crack, deformation or any other damage.
- If defective, replace.

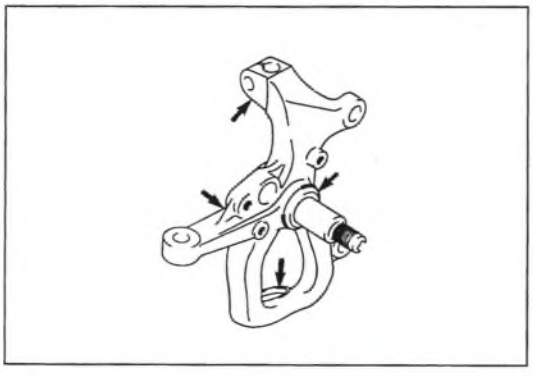


HUB BEARING

If any abnormality is noted, such as excessive looseness in vertical direction and unsmooth rotation, replace hub assembly.

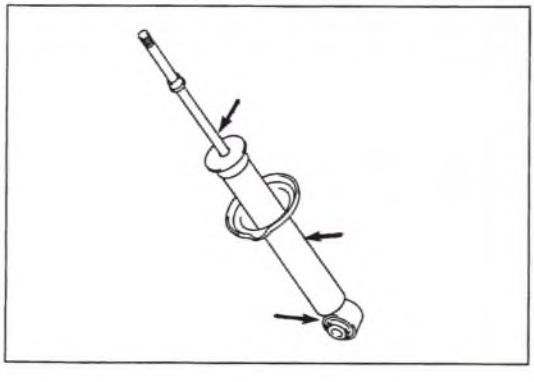
NOTE:

Bearing can not be separated from hub. It must be replaced together with hub when replacement becomes necessary.



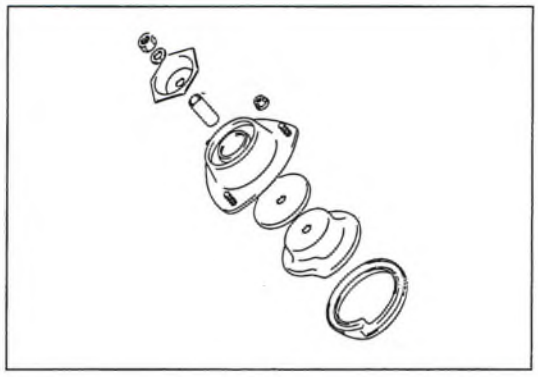
KNUCKLE

Inspect for cracks, deformation or damage. If defective, replace.



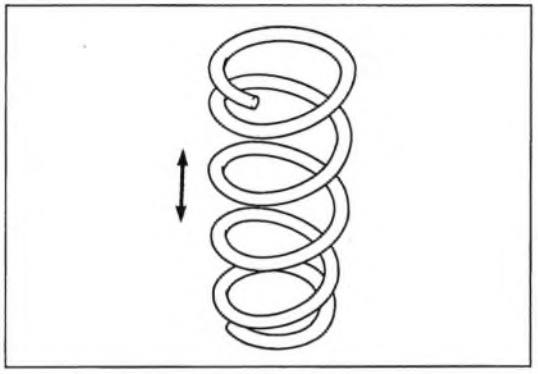
SHOCK ABSORBER

Inspect shock absorber for bend, oil leakage or damage. If defective, replace.



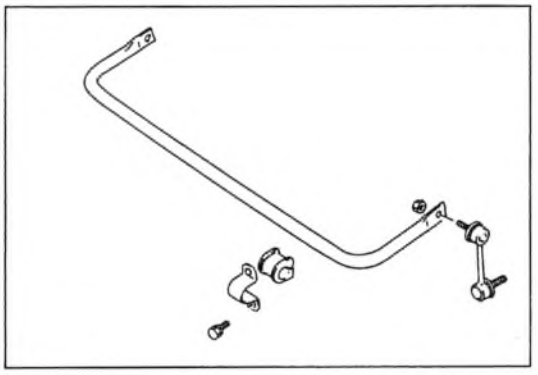
STRUT SUPPORT, SPRING SEAT

Inspect for cracks, deformation or damage. If defective, replace.



SPRING

Inspect for cracks, deformation or damage. If defective, replace.

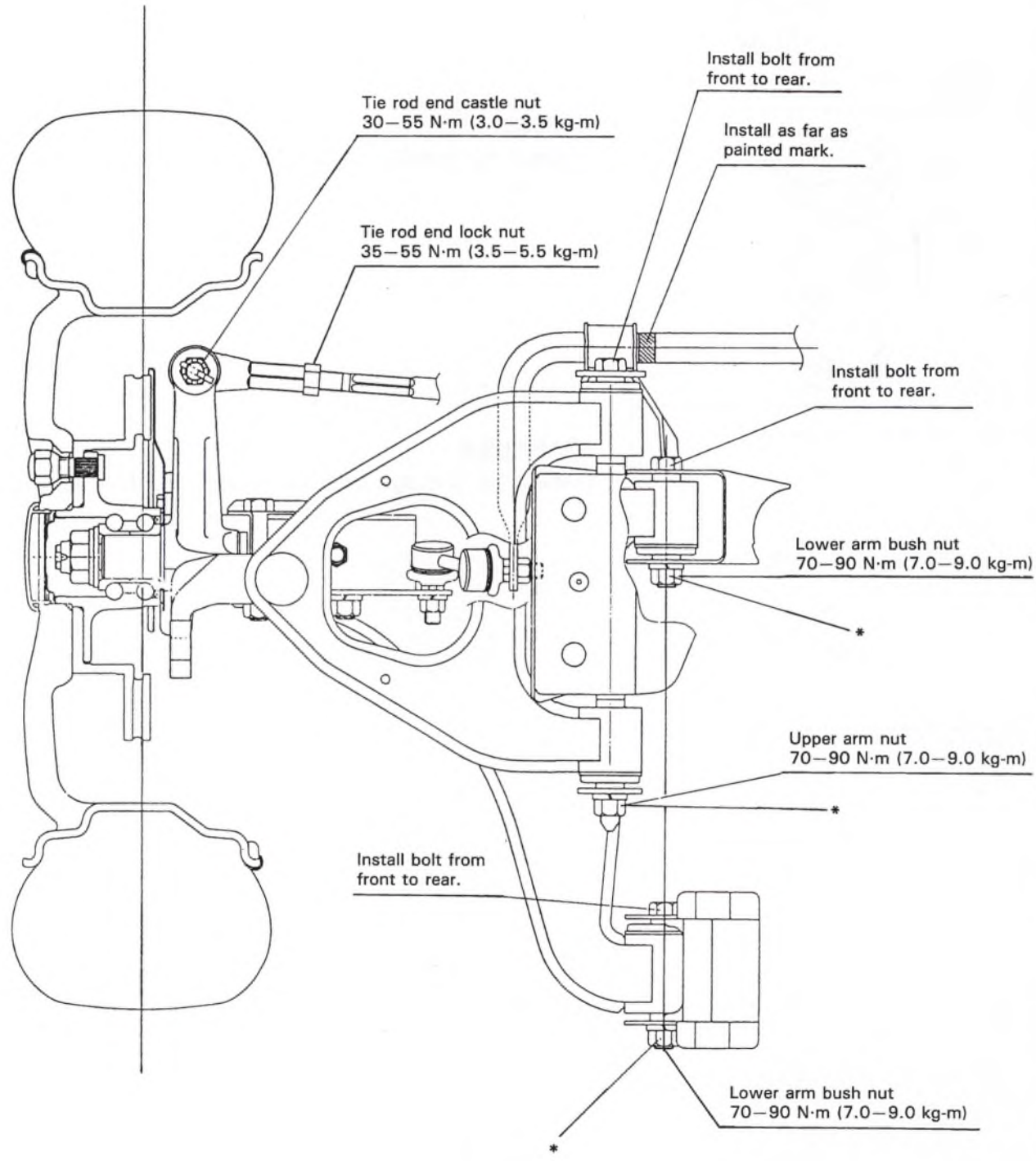


STABILIZER

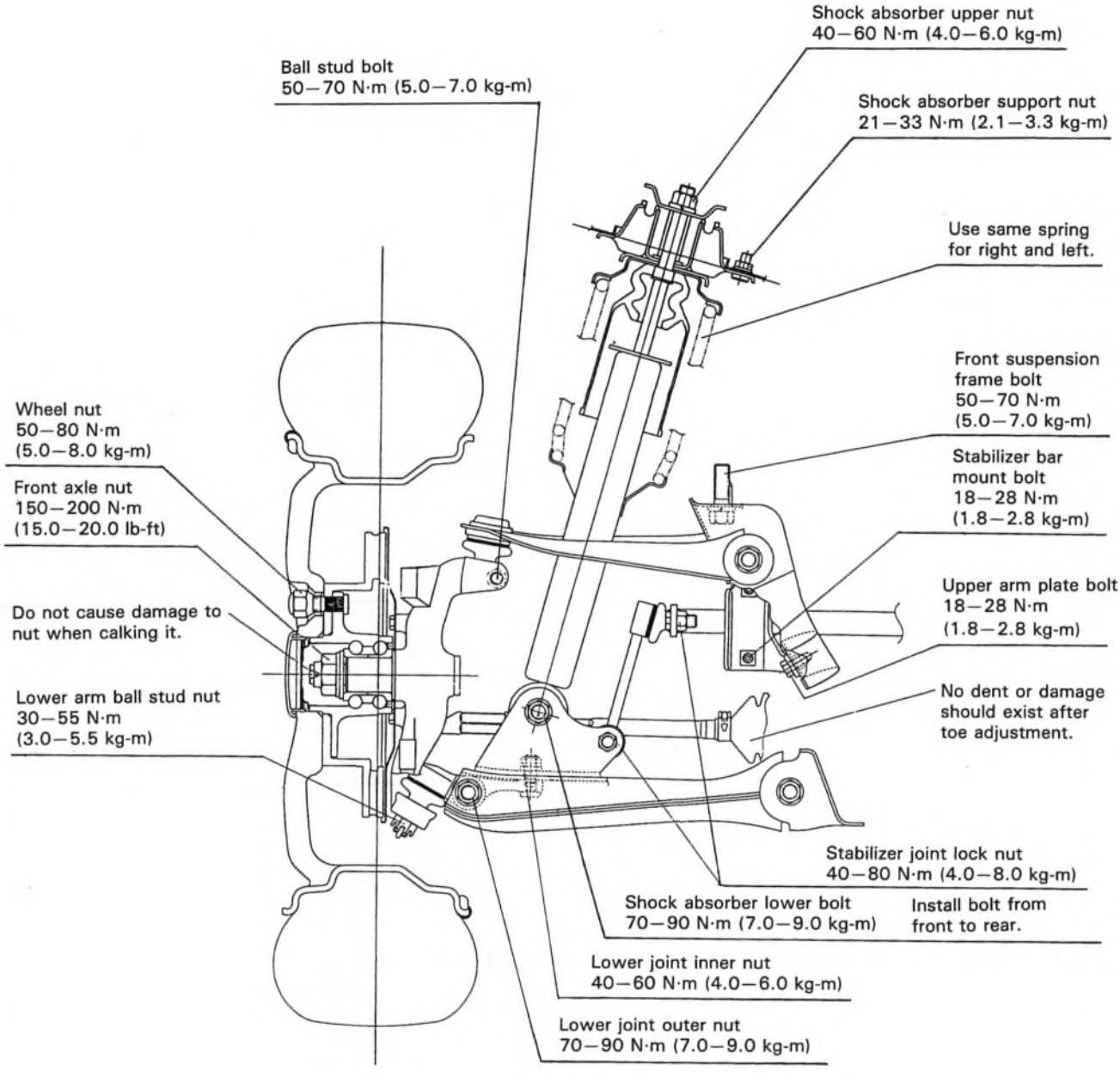
Inspect for damage or deformation. If defective, replace.

INSTALLATION

Reverse removal procedure for installation, noting following points as shown below.



NOTE:
To install nut indicated with * in this diagram, tighten it to specified torque with vehicle placed off from hoist and in unladen state.


Shock absorber upper nut
40—60 N·m (4.0—6.0 kg-m)
Ball stud bolt
50—70 N·m (5.0—7.0 kg-m)
Shock absorber support nut
21—33 N·m (2.1—3.3 kg-m)
Use same spring
for right and left.
Front suspension
frame bolt
50—70 N·m
(5.0—7.0 kg-m)
Wheel nut
50—80 N·m
(5.0—8.0 kg-m)
Stabilizer bar
mount bolt
18—28 N·m
(1.8—2.8 kg-m)
Front axle nut
150—200 N·m
(15.0—20.0 lb-ft)
Upper arm plate bolt
18—28 N·m
(1.8—2.8 kg-m)
Do not cause damage to
nut when calking it.
No dent or damage
should exist after
toe adjustment.
Lower arm ball stud nut
30—55 N·m
(3.0—5.5 kg-m)
Stabilizer joint lock nut
40—80 N·m (4.0—8.0 kg-m)
Shock absorber lower bolt
70—90 N·m (7.0—9.0 kg-m)
Install bolt from
front to rear.
Lower joint inner nut
40—60 N·m (4.0—6.0 kg-m)
Lower joint outer nut
70—90 N·m (7.0—9.0 kg-m)

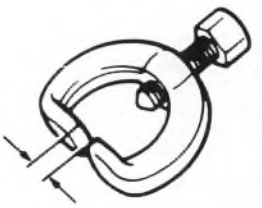
RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque	
	N·m	kg-m
1. Upper arm bolt	70—90	7.0—9.0
2. Ball stud bolt	50—70	5.0—7.0
3. Lower joint inner nut	40—60	4.0—6.0
4. Lower joint outer nut	70—90	7.0—9.0
5. Lower arm bush bolt	70—90	7.0—9.0
6. Lower arm ball stud nut	30—55	3.0—5.5
7. Tie rod end castle nut	30—55	3.0—5.5
8. Tie rod end lock nut	35—55	3.5—5.5
9. Shock absorber upper nut	40—60	4.0—6.0
10. Shock absorber lower nut	70—90	7.0—9.0
11. Shock absorber support nut	21—33	2.1—3.3
12. Front axle nut	150—200	15.0—20.0
13. Front suspension frame bolt	50—70	5.0—7.0

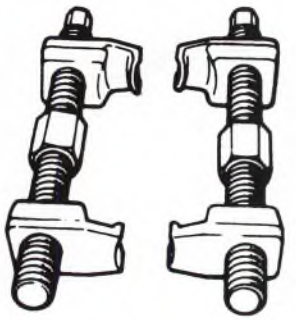
SPECIAL TOOLS



09913-65210
Tie-rod end remover



09913-65230
Tie-rod end remover



09940-71430
Spring compressor

SECTION 3E

REAR SUSPENSION

NOTE:

- **All suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.**
- **Never attempt to heat, quench or straighten any suspension part. Replace it with a new part, or damage to the part may result.**

64B40-3E-1-1

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REQUIRED SREVICE MATERIALS 3E-13
SPECIAL TOOLS 3E-14

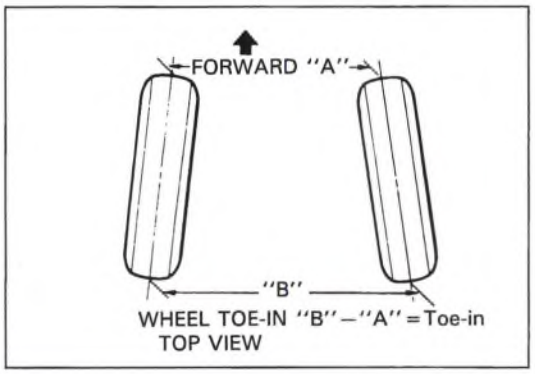
64B40-3E-1-2

REAR WHEEL ALIGNMENT

INSPECTION AND ADJUSTMENT

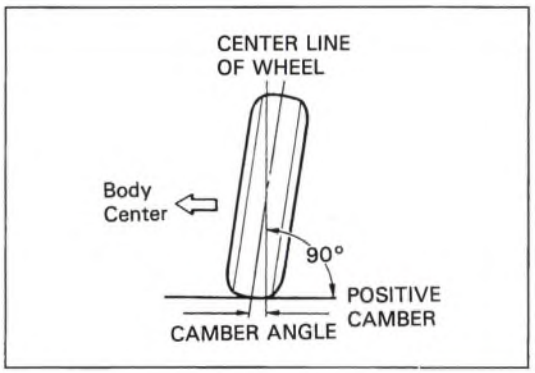
Preparation for inspection and adjustment.

- Place vehicle in non-loaded state on level floor.
- Set steering wheel in straight state.
- Check that inflation pressure of each tire is adjusted properly and disc wheel is free from deflection.
- Check that each suspension part is free from bend, dent, looseness, wear or damage in any other form.
- Check that ground clearance at the right and left is just about the same.
- Check wheel (hub) bearing for looseness.
- Check that tire is free from excessive/uneven wear.



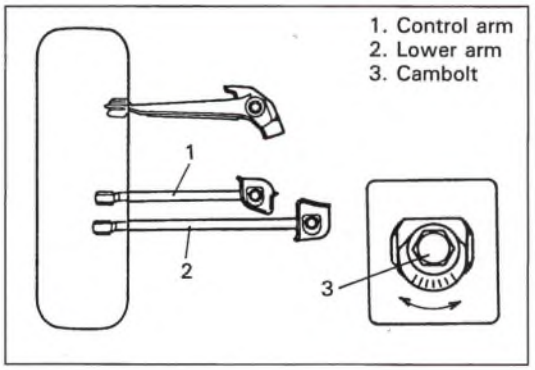
1) Inspect toe-in with toe-in gauge.

Toe-in: 2 ± 2 mm



2) Remove wheel center cap and check rear wheel camber with camber gauge.

Chamber: − 1°



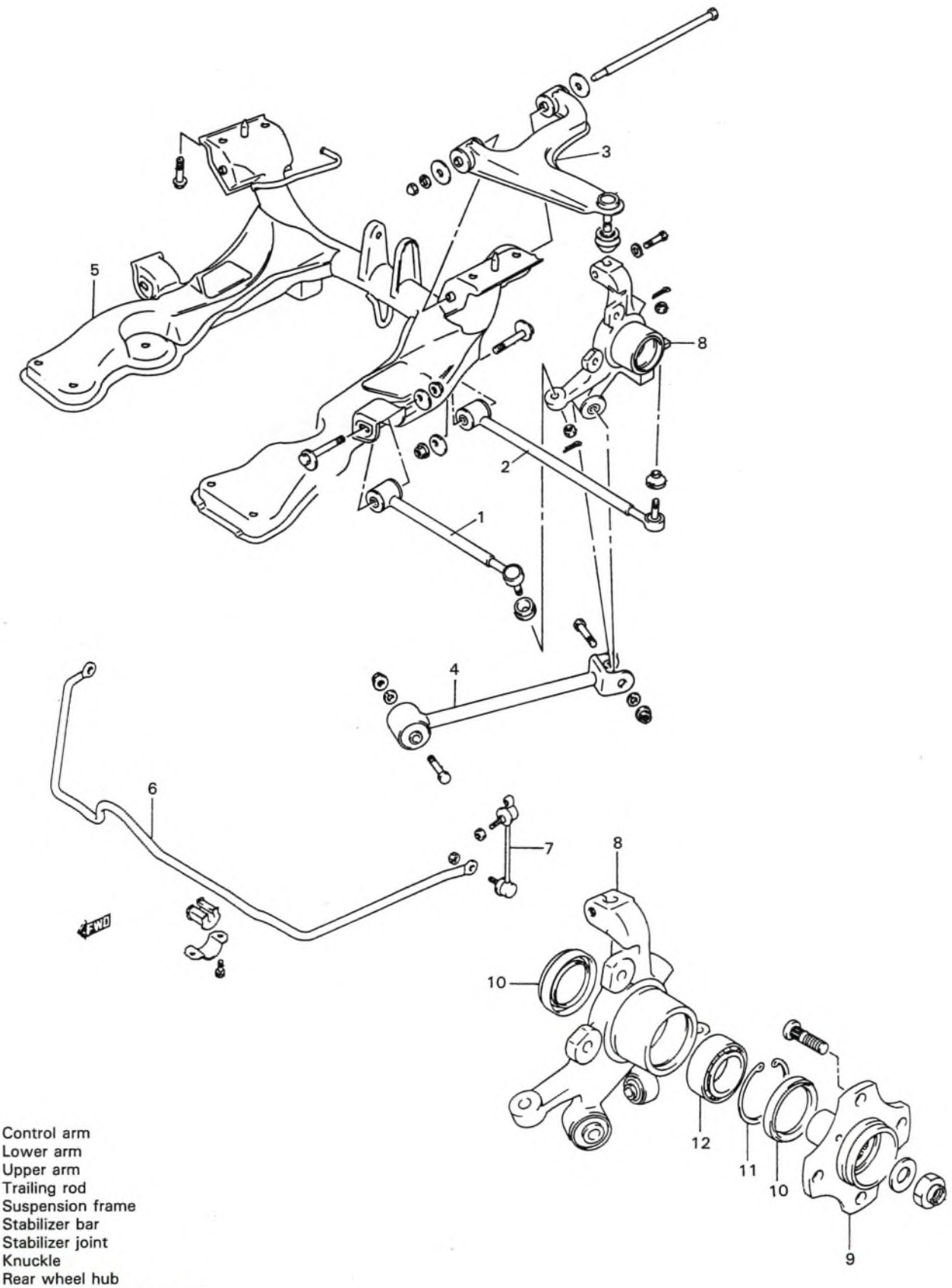
When specified value is not satisfied in above 1) and 2) checks, loosen nut at each frame installation section of control arm and lower arm and make adjustment by turning each cambolt.

NOTE:
Adjust toe-in first and then camber. For camber adjustment, turn each cambolt of control arm and lower arm by the same amount.

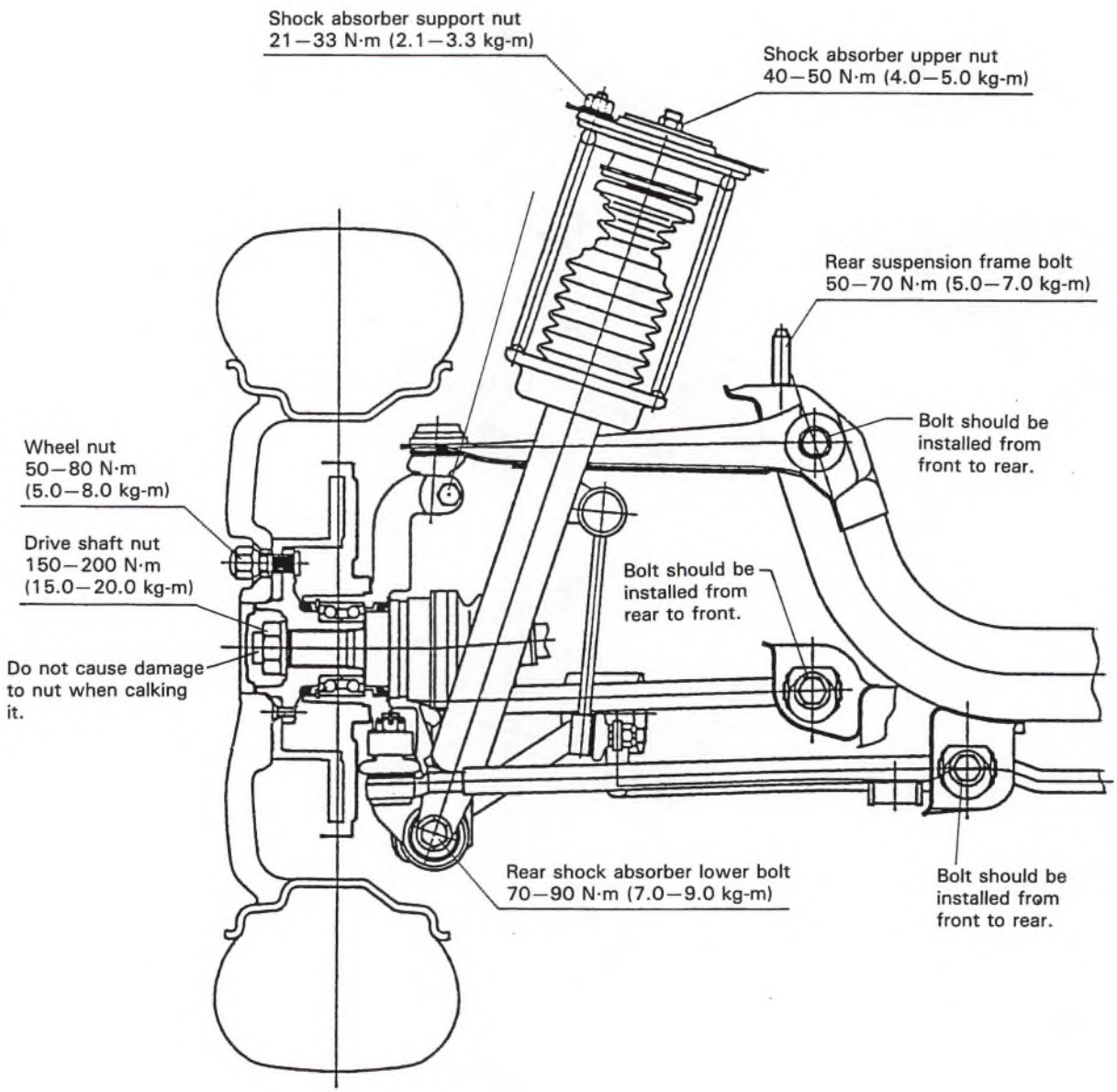
Reference information
Side slip:
For inspecting rear wheel side slip with side slip tester:
Side slip: (IN) 3.5 − (IN) 0.5 mm/m

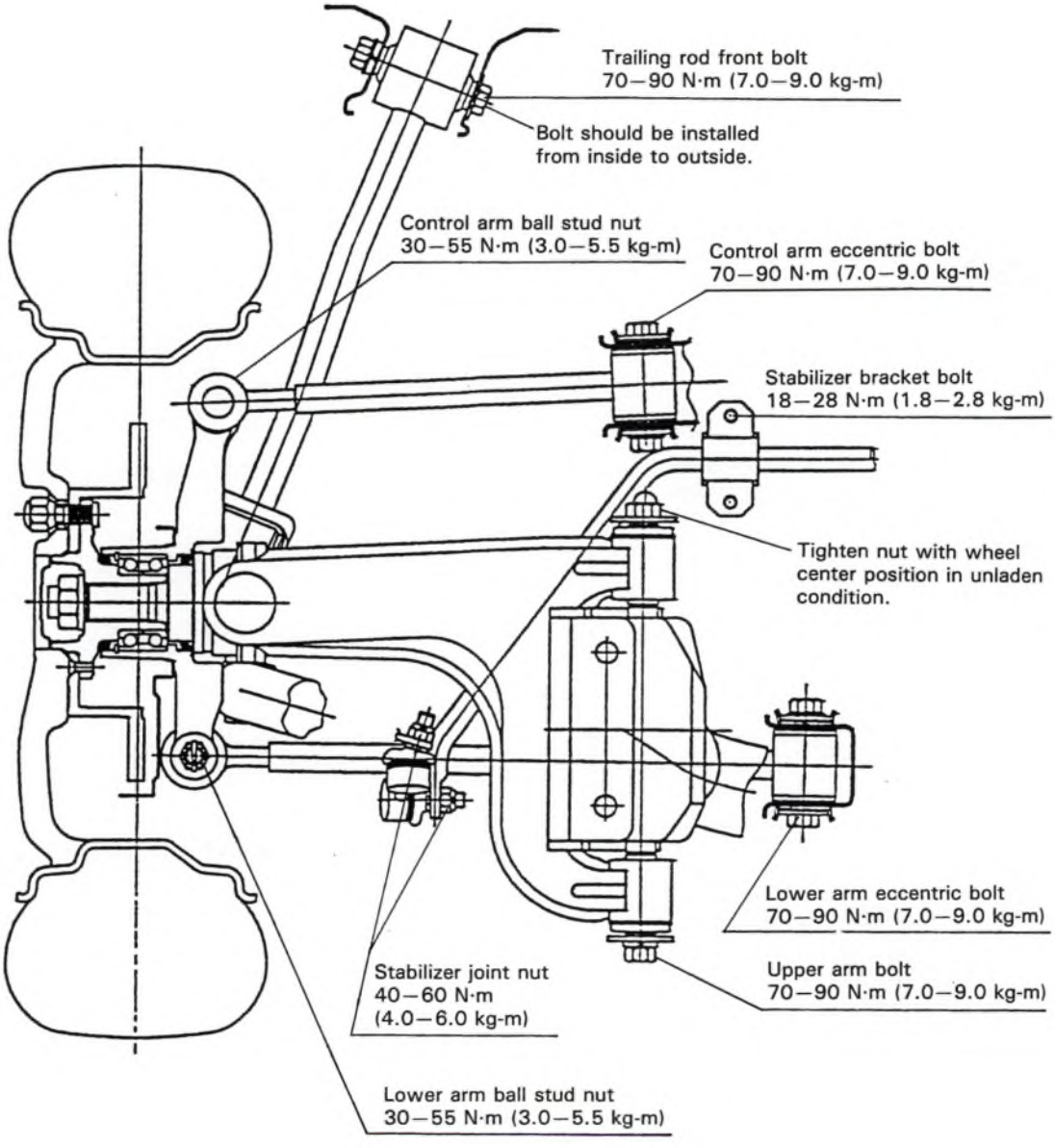
If side slip exceeds above limit, toe-in or camber may not be correct.

ON-VEHICLE SERIVE



1. Control arm
2. Lower arm
3. Upper arm
4. Trailing rod
5. Suspension frame
6. Stabilizer bar
7. Stabilizer joint
8. Knuckle
9. Rear wheel hub
10. Rear wheel bearing oil seal
11. Rear wheel bearing circlip
12. Rear wheel bearing

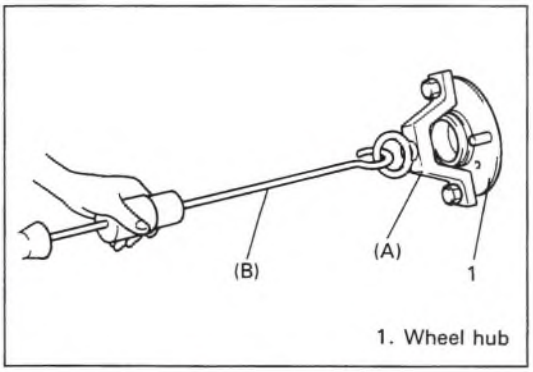

Shock absorber support nut
21—33 N·m (2.1—3.3 kg-m)
Shock absorber upper nut
40—50 N·m (4.0—5.0 kg-m)
Rear suspension frame bolt
50—70 N·m (5.0—7.0 kg-m)
Bolt should be installed from front to rear.
Wheel nut
50—80 N·m
(5.0—8.0 kg-m)
Drive shaft nut
150—200 N·m
(15.0—20.0 kg-m)
Bolt should be installed from rear to front.
Do not cause damage to nut when calking it.
Rear shock absorber lower bolt
70—90 N·m (7.0—9.0 kg-m)
Bolt should be installed from front to rear.


Trailing rod front bolt
70—90 N·m (7.0—9.0 kg-m)
Bolt should be installed from inside to outside.
Control arm ball stud nut
30—55 N·m (3.0—5.5 kg-m)
Control arm eccentric bolt
70—90 N·m (7.0—9.0 kg-m)
Stabilizer bracket bolt
18—28 N·m (1.8—2.8 kg-m)
Tighten nut with wheel center position in unladen condition.
Lower arm eccentric bolt
70—90 N·m (7.0—9.0 kg-m)
Upper arm bolt
70—90 N·m (7.0—9.0 kg-m)
Stabilizer joint nut
40—60 N·m
(4.0—6.0 kg-m)
Lower arm ball stud nut
30—55 N·m (3.0—5.5 kg-m)

1. WHEEL HUB AND KNUCKLE

REMOVAL

1) Remove wheel center cap.
2) Uncalk and remove drive shaft nut.
3) Hoist vehicle and remove wheel.
4) Remove brake caliper and brake disc. (Refer to SECTION 5).

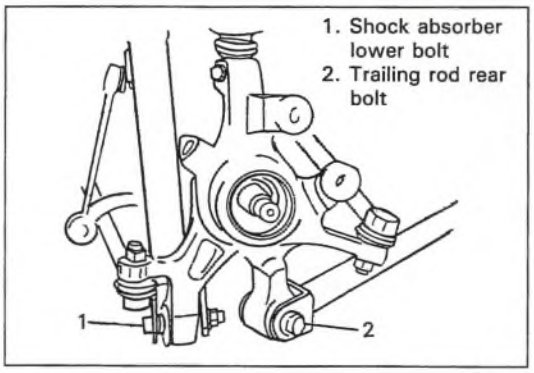


1. Wheel hub

5) Pull wheel hub off by using special tools.

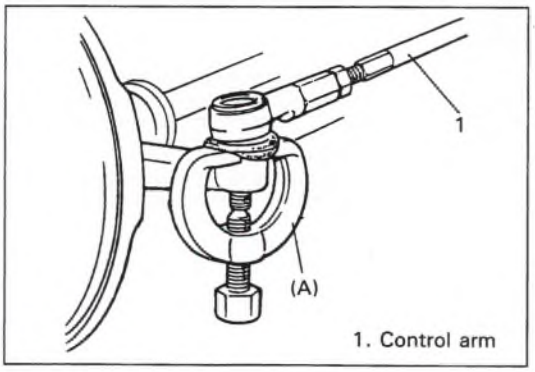
Special Tools
(A): 09943-17911
(B): 09942-15510

6) Remove brake disc dust cover from knuckle.



1. Shock absorber lower bolt
2. Trailing rod rear bolt

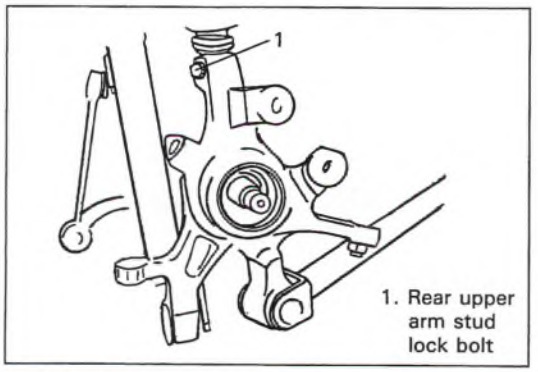
7) Remove shock absorber lower bolt and trailing rod rear bolt.



1. Control arm

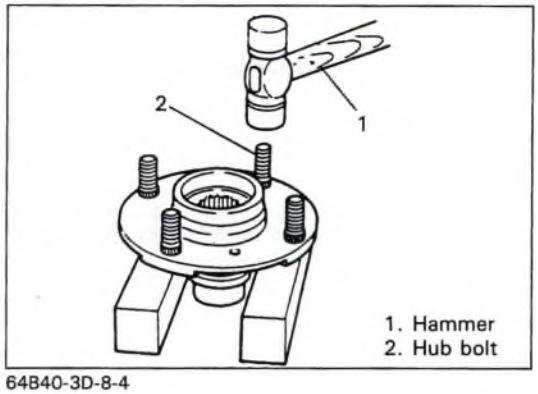
8) Disconnect control arm from knuckle by using special tool.

Special Tool
(A): 09913-65210



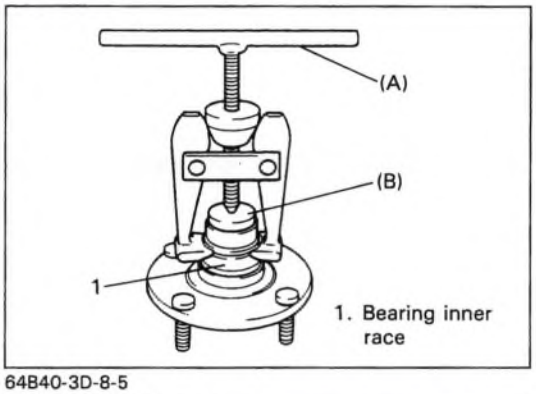
1. Rear upper arm stud lock bolt

9) Remove rear upper arm stud lock bolt, then remove knuckle.



64B40-3D-8-4

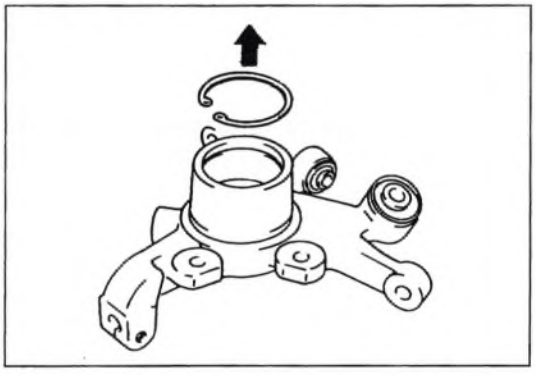
10) Remove hub bolts.



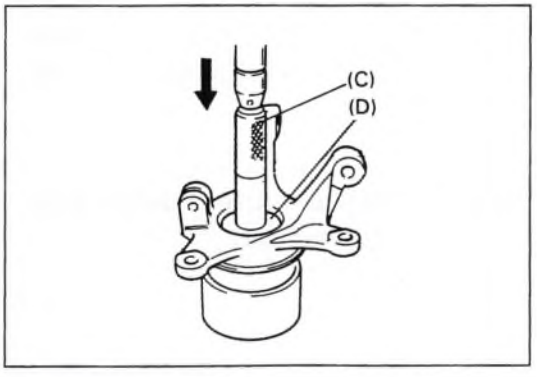
64B40-3D-8-5

11) Remove wheel bearing inner race.

Special Tools
(A): 09913-61110
(B): 09913-85230

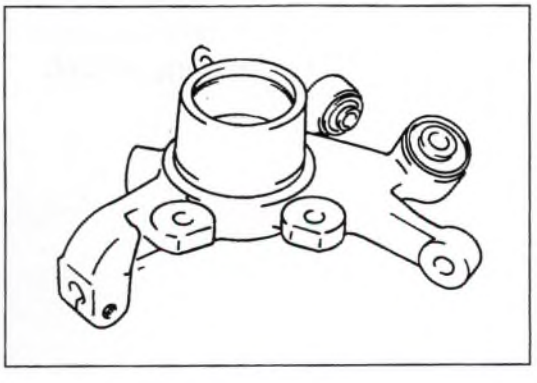


12) Remove oil seal and snap ring.

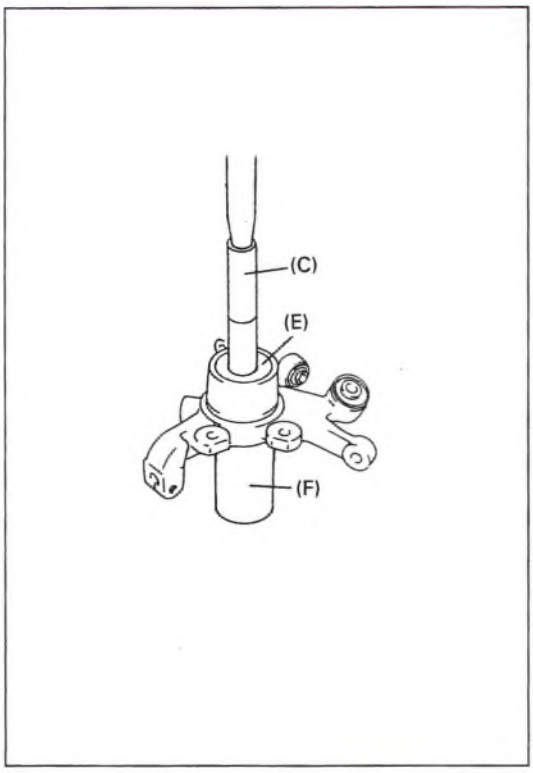


13) Remove bearing by using special tools (C) and (D), and hydraulic press.

Special Tools
(C): 09924-74510
(D): 09944-68510



INSPECTION
Inspect hub and knuckle for cracks, deformation or damage.



INSTALLATION

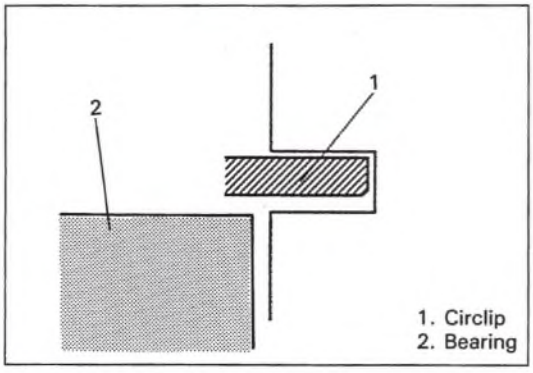
Install in reverse order of removal procedure noting following points.

1) Press-fit bearing by using special tools.

NOTE:
Removed bearing, bearing inner race and oil seal should not be reused. Use new ones instead.

Special Tools
(C): 09944-74510
(E) : 09951-16090
(F) : 09944-78210

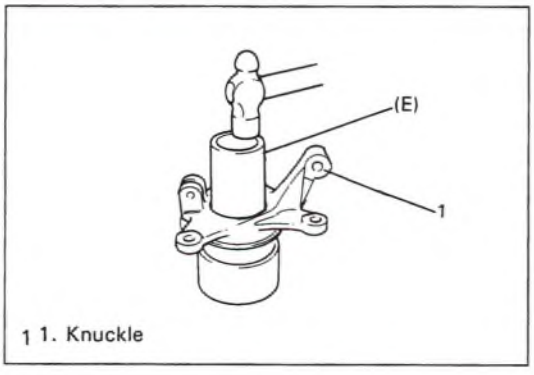
NOTE:
- **Pres-fit bearing so that number on its side faces toward wheel.**
- **Never tap it to install inner race.**



1. Circlip
2. Bearing

2) Install circlip to knuckle.

NOTE:
Install circlip so that its chamfered side faces toward bearing.

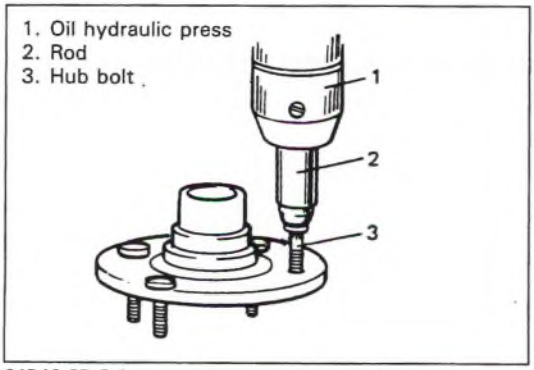


1 1. Knuckle

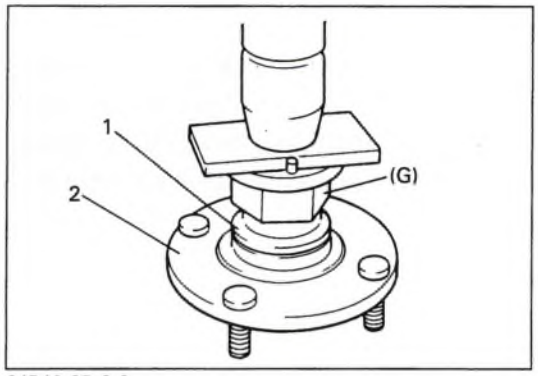
3) After greasing (Lithic grease) oil seal lips, drive in oil seal until seal is flush with stopped surface of knuckle by using special tool (E).

NOTE:
When driving in oil seal, be careful not to deform or tilt it or not to cause damage to rubber part.

Special Tool
(E): 09944-78210



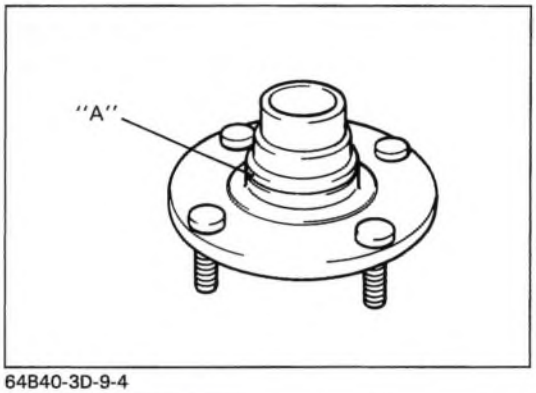
4) Insert new stud in hub hole. Rotate stud slowly to assure serrations are aligned with those made by original bolt.



64B40-3D-9-2

5) Install outside inner race to wheel hub using special tool. Installing direction is as shown.

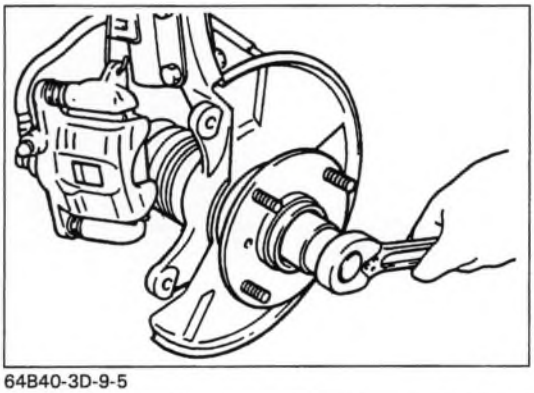
Special Tool
(G): 09944-98010



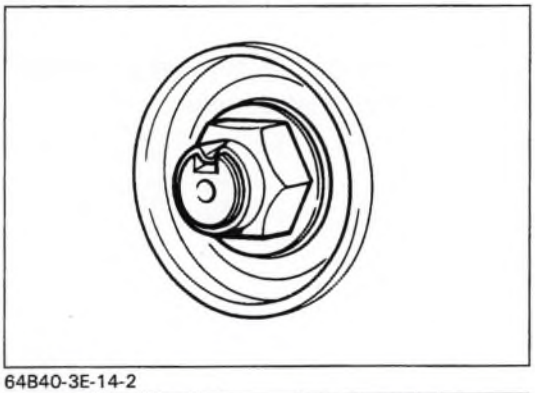
64B40-3D-9-4

6) Apply grease to outside bearing, outside inner race and oil seal lip.

"A": Grease 99000-25010


64B40-3D-9-5

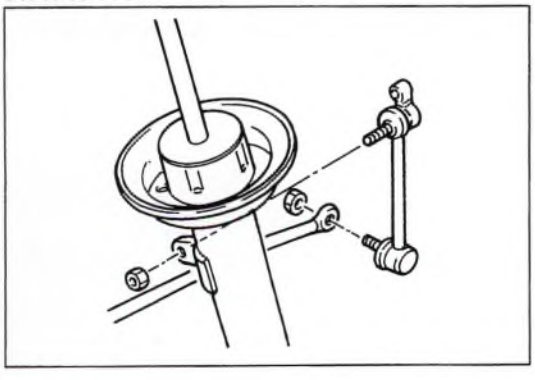
7) Fit dust cover to knuckle and calk at 3 locations.
8) Install wheel hub to knuckle by tightening drive shaft nut. Don't tap wheel hub.


64B40-3E-14-2

9) Depress foot brake pedal and hold it there.
Tighten drive shaft nut and brake disc screws to specified torque.

Tightening Torque:
150—200 N·m (15.0—20.0 kg-m)

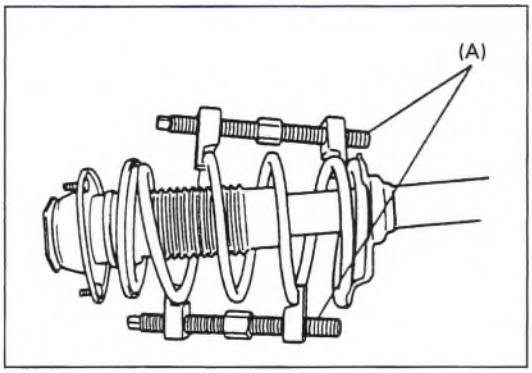
10) Calk drive shaft nut as shown.



2. SHOCK ABSORBER ASSEMBLY

REMOVAL

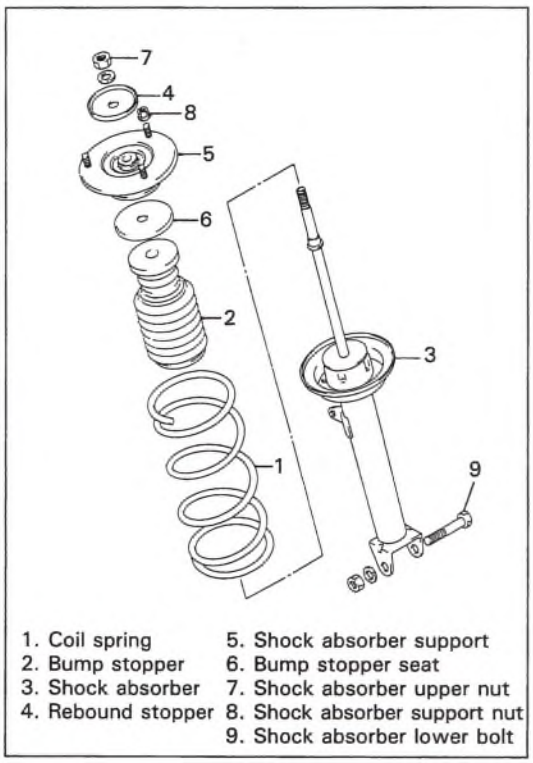
1) Remove stabilizer joint from absorber.
2) Remove shock absorber lower nut and shock absorber support nuts. Hold shock absorber by hand so that it will not fall off.
Remove shock absorber assembly.



DISASSEMBLY

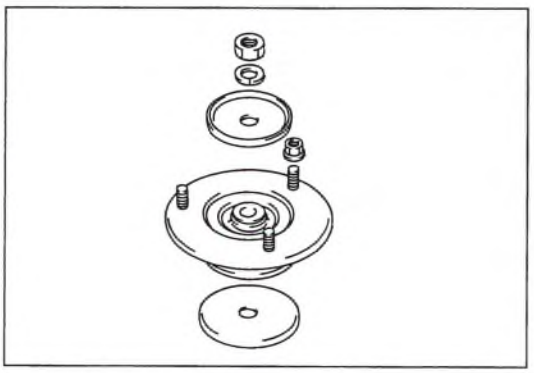
1) With special tool (A) placed to spring as shown, turn special tool bolts alternately until spring tension is released. Whether it is released or not can be known by whether shock absorber turns lightly while strut spring is held stationary.

Special Tool
(A): 09940-71430



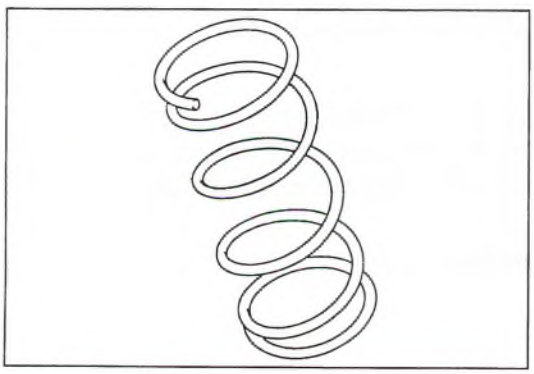
1. Coil spring
2. Bump stopper
3. Shock absorber
4. Rebound stopper
5. Shock absorber support
6. Bump stopper seat
7. Shock absorber upper nut
8. Shock absorber support nut
9. Shock absorber lower bolt

2) While keeping spring compressed with special tool as shown above, remove strut nut and then disassemble parts.

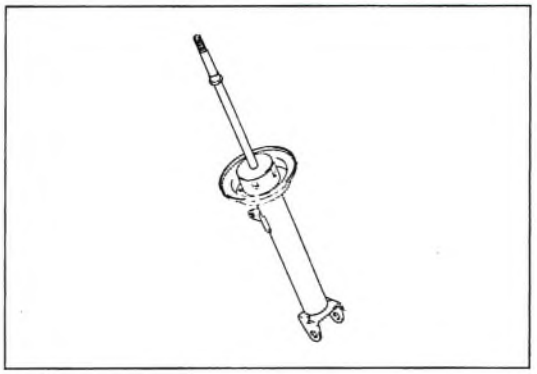


INSPECTION

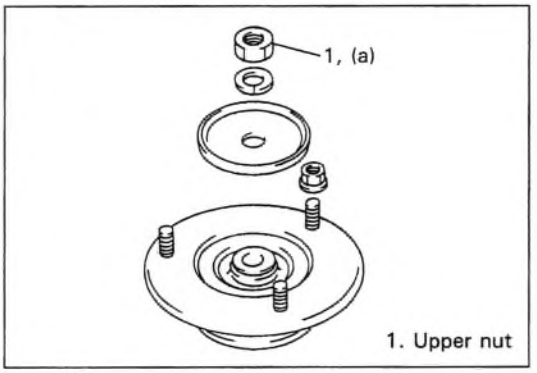
- Inspect rebound stopper, shock absorber support and bump stopper for cracks, deformation and damage.
 If defective, replace.



- Inspect spring for deterioration, cracks, deformation or damage.
 If defective, replace.



- Inspect shock absorber for bend, oil leakage or damage. If defective, replace.



ASSEMBLY

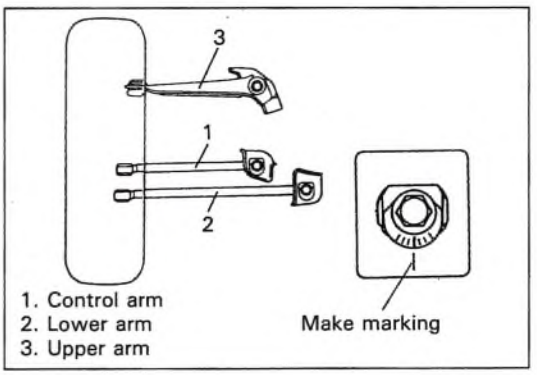
Reverse disassembly procedure for assembly.

Tightening Torque

(a): 40—60 N·m (4.0—6.0 kg-m)

Installation

Install in reverse order of removal procedure noting pages 3E-3 and 4.

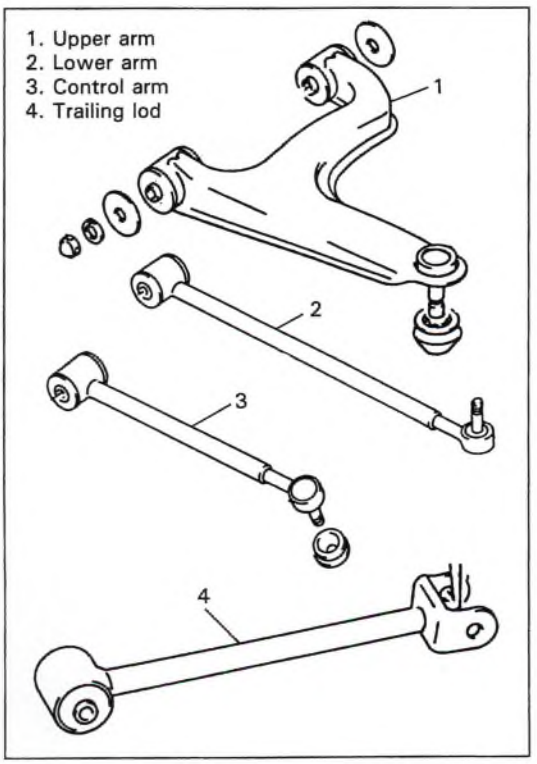


3. SUSPENSION ARMS

REMOVAL

1) Remove wheel hub and knuckle, referring to Item 1.
2) Remove shock absorber, referring to Item 2.
3) Remove control arm, lower arm and upper arm.

NOTE:
Make match marks before loosening arm bolts.

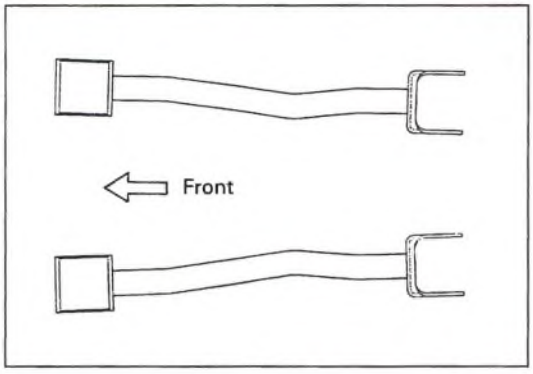


INSPECTION

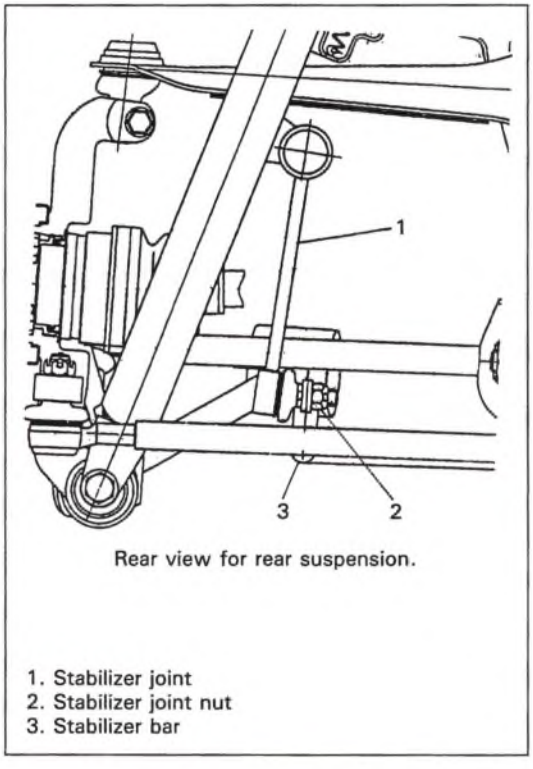
Upper Arm, Lower Arm, Control Arm, Trailing Rod

- Inspect for cracks, deformation or damage.
- Inspect bushing for damage, wear or breakage.

Replace any defective part.



INSTALLATION
Install in reverse order of removal procedure noting following point.
- Use care so that trailing rod is installed in correct direction.

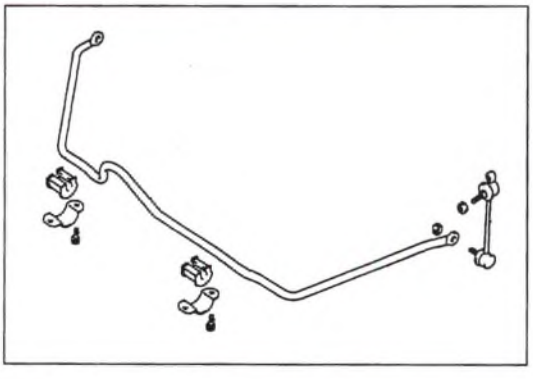


Rear view for rear suspension.

1. Stabilizer joint
2. Stabilizer joint nut
3. Stabilizer bar

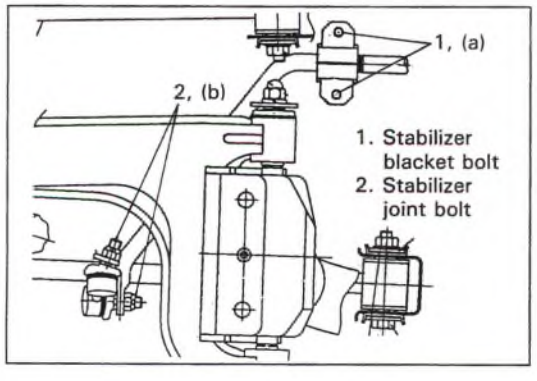
4. STABILIZER BAR, JOINT AND BUSHING

REMOVAL
1) Remove exhaust center No.2 pipe, referring to ENGINE EXHAUST of SECTION 6K.
2) Remove stabilizer joint nuts.
3) Remove stabilizer bar bracket and stabilizer bar.
4) Remove stabilizer joint from shock absorber.



INSPECTION
Stabilizer bar and bushing.
- Inspect for cracks, deformation or damage.
- Inspect bushing for damage, wear or breakage.

Replace any defective parts.



INSTALLATION
Reverse removal procedure for installation.

Tightening Torque

(a): 18—28 N·m (1.8—2.8 kg-m)

(b): 40—60 N·m (4.0—6.0 kg-m)

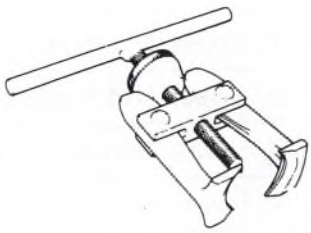
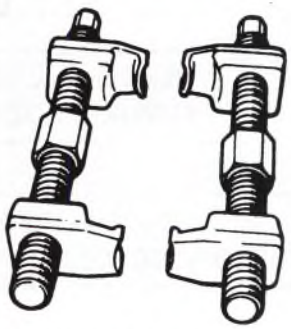
RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque	
	N·m	kg-m
1. Upper arm bolt	70—90	7.0—9.0
2. Upper arm stud lock bolt	50—70	5.0—7.0
3. Lower arm eccentric bolt	70—90	7.0—9.0
4. Lower arm ball stud nut	30—55	3.0—5.5
5. Control arm eccentric bolt	70—90	7.0—9.0
6. Control arm ball stud nut	30—55	3.0—5.5
7. Trailing rod front and rear bolt	70—90	7.0—9.0
8. Shock absorber upper nut	40—50	4.0—5.0
9. Shock absorber support nut	21—33	2.1—3.3
10. Shock absorber lower bolt	70—90	7.0—9.0
11. Rear suspension frame bolt	50—70	5.0—7.0
12. Drive shaft nut	150—200	15.0—20.0
13. Wheel nut	50—80	5.0—8.0

REQUIRED SERVICE MATERIALS

MATERIAL	RERCOMMENDED SUZUKI PRODUCT	USE
Brake fluid	DOT3	Brake reservoir tank
Lithic wheel bearing grease	SUZUKI SUPER GREASE (A) (99000-25010)	Wheel bearing, wheel bearing oil seal lip

SPECIAL TOOLS

 09942-15510 Sliding hammer	 09943-17911 Brake drum remover	 09913-65210 Tie-rod end remover	 09913-61110 Bearing puller
 09913-85230 Bearing puller attachment	 09924-74510 Bearing installer handle	 09944-68510 Bearing installer attachment	 09944-78210 Bearing installer support
 09951-16090 Bearing & oil seal installer	 09944-98010 Bearing installer	 09940-71430 Spring compressor	

SECTION 3F

WHEELS AND TIRES

NOTE:
All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

64B40-3F-1-1

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64B40-3F-1-2

GENERAL DESCRIPTION

TIRES

This vehicle is equipped with either of following tires 165/65R14 78H
165/65R14 79H

The tire is of tubeless type. The tire is designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

WHEELS

Standard equipment wheels are the following aluminum wheels 14 x 5J

COMPACT SPARE TIRE

This vehicle is equipped with the compact spare tire. It is only intended for temporary emergency use, until the conventional tire can be repaired or replaced.
Inflation pressure of the compact spare tire is set at 420 kPa (4.2 kg/cm^2).

REPLACEMENT TIRES

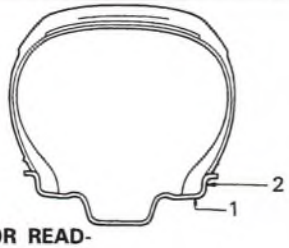
When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard. Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire may affect ride, handling, speedometer/odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.

WARNING:
Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because handling may be seriously affected and may result in loss of control.

It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

REPLACEMENT WHEELS

Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, air leak through welds, have elongated bolt holes, if lug nuts won't stay tight, or if they are heavily rusted. Wheels with greater runout than shown in figure below may cause objectional vibrations.
Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim with offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, vehicle ground clearance and tire clearance to body and chassis.



*TOTAL INDICATOR READING IGNORE INDICATOR "JUMPS" DUE TO WELD SEAMS, PAINT RUNS, SCRATCHES, ETC.

1. Radial runout
2. Lateral runout

64B40-3F-2-5

HOW TO MEASURE WHEEL RUNOUT

To measure the wheel runout, it is necessary to use an accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement.
Take measurements of both lateral runout and radial runout at both inside and outside of the rim flange. With the dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator.

When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.

	Radial runout limit	Lateral runout limit
Steel wheel	1.14 mm (0.045 in.)	1.40 mm (0.055 in.)
Alminum wheel	0.70 mm (0.028 in.)	0.70 mm (0.028 in.)

64B40-3F-3-1

MAINTENANCE AND MINOR ADJUSTMENTS

WHEEL MAINTENANCE

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

WHEEL ATTACHING STUDS

If a broken stud is found, see Section 3E (rear) or Section 3D (front) for Note and Replacement procedure.

INFLATION OF TIRES

The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.

Tire pressure, with tires cold, (after vehicle has set for three hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the tire placard located on the left door (right door for right-hand side steering car) lock pillar.

It is normal for tire pressure to increase to 28 kPa (4 psi) when the tires become hot during driving. **Do not** bleed or reduce tire pressure after driving. Bleeding reduces the ''Cold Inflation Pressure''.

Higher than recommended pressure can cause:

1. Hard ride
2. Tire bruising or carcass damage
3. Rapid tread wear at center of tire

Unequal pressure on same axle can cause:

1. Uneven braking
2. Steering lead
3. Reduced handling
4. Swerve on acceleration

Valve caps should be on the valves to keep dust and water out.

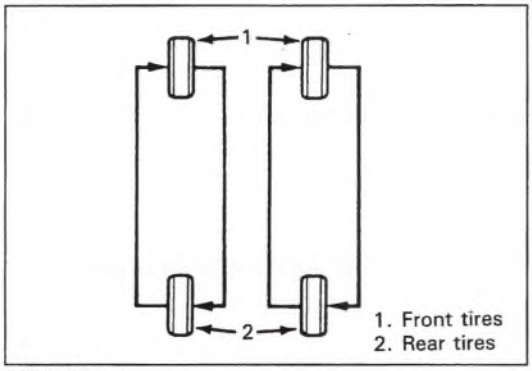
Lower than recommended pressure can cause:

1. Tire squeal on turns
2. Hard Steering
3. Rapid and uneven wear on the edges of the tread
4. Tire rim bruises and rupture
5. Tire cord breakage
6. High tire temperature
7. Reduced handling
8. High fuel consumption

TIRE PLACARD

The tire placard is located on the right door lock pillar and should be referred to for tire information.
The placard lists the maximum load, tire size and cold tire pressure where applicable.

64B40-3F-4-4

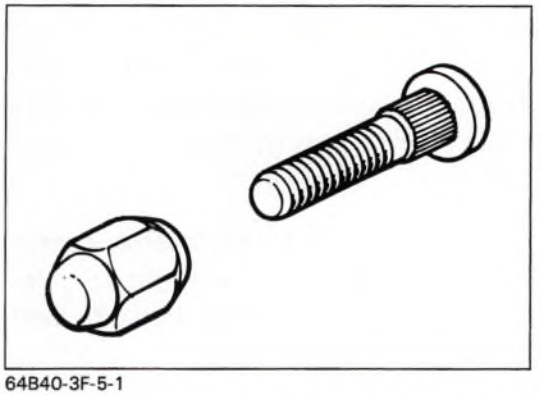


64B40-3F-4-5

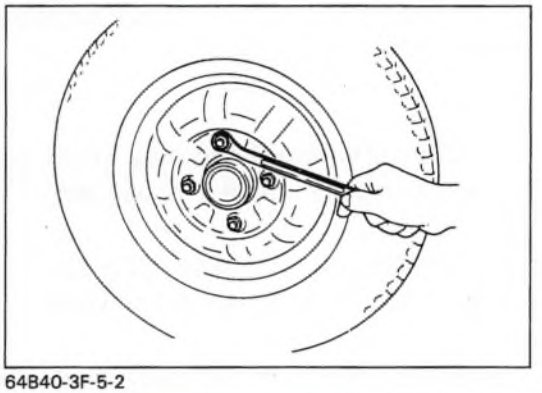
TIRE ROTATION

To equalize wear, rotate tires according to left figure. Radial tires should be rotated at the first 10,000 km and after that, tire rotation at least every 10.000 km is recommended. Set tire pressure.

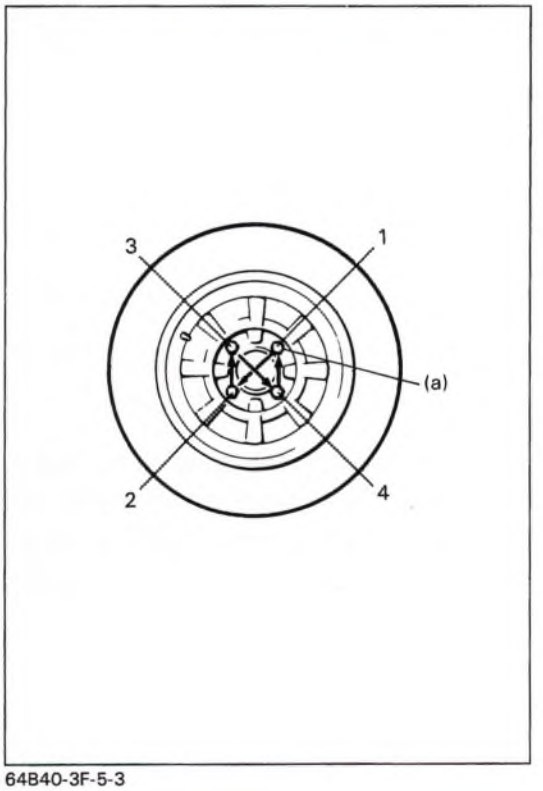
NOTE:
Due to their design, radial tires tend to wear faster in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.



64B40-3F-5-1



64B40-3F-5-2



64B40-3F-5-3

ON-VEHICLE SERVICE

SERVICE OPERATIONS

METRIC LUG NUTS AND WHEEL STUDS

All models use metric lug nuts and wheel studs (size: M12 x 1.25).

WHEEL REMOVAL

1) Loosen wheel nuts by approximately 180° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

CAUTION:
Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.

Wheel nuts must be tightened in sequence and to proper torque to avoid bending wheel or brake disc, left figure.

NOTE:
Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow a wheel to come off while vehicle is moving.

Tightening Torque
(a): 50—80 N·m (5.0—8.0 kg-m)

TIRE MOUNTING AND DEMOUNTING

Use a tire changing machine to mount or demount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.

Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or demounting a tire, bead area should be well lubricated with approved tire lubricant.

After mounting, inflate to specified pressure shown on tire pracard so that beads are completely seated.

WARNING:
Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and reinflate.
Over inflation may cause bead to break and cause serious personal injury.

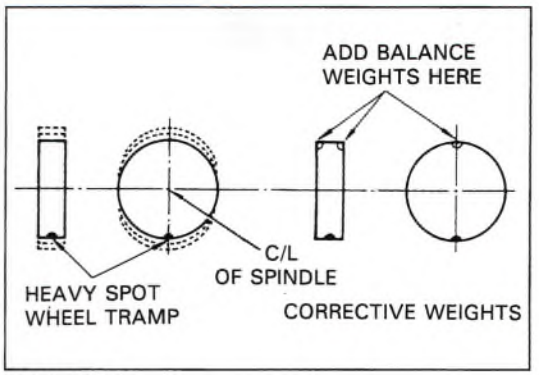
Install valve core and inflate to proper pressure.

64B40-3F-6-1

TIRE REPAIR

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detalied instructions on how and when to repair tires. These instructions can be obtained from each tire manufacturer.

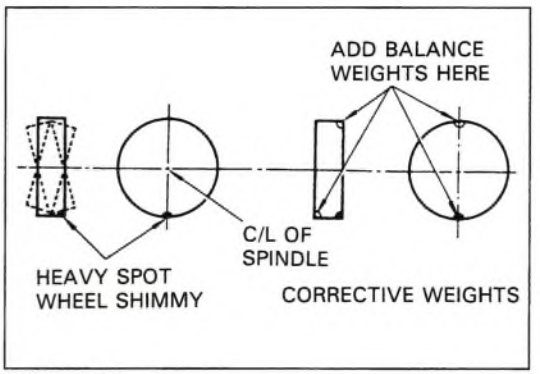
64B40-3F-6-4



64B40-3F-7-1

BALANCING WHEELS

There are two types of wheel and tire balance: static and dynamic. Static balance, as shown in left figure, is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.



64B40-3F-7-2

Dynamic balance, as shown in left figure, is the equal distribution of weight on each side of the wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.

GENERAL BALANCE PROCEDURES

Deposits of mud, etc. must be cleaned from inside of rim.

WARNING:
Stones should be removed from the tread in order to avoid operator injury during spin balancing and to obtain good balance.

Each tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

OFF-VEHICLE BALANCING

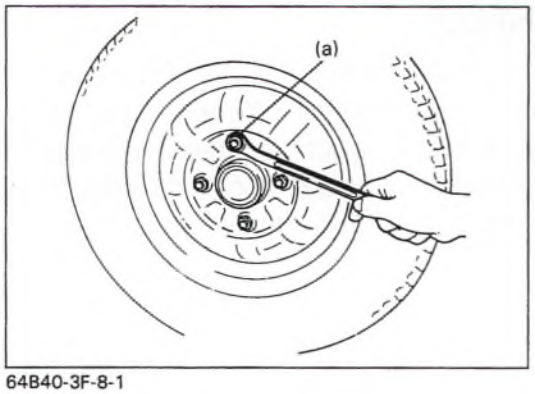
Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin blancing, this is overcome by their accuracy, usually to within 1/8 ounce.

ON-VEHICLE BALANCING

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

WARNING:
Wheel spin should be limited to 55 km/h as indicated on speedometer.
This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped.
Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive vehicle damage.

64B40-3F-7-3



64B40-3F-8-1

RECOMMENDED TORQUE SPECIFICATIONS

Tightening Torque for wheel nuts
(a): 50—80 N·m (5.0—8.0 kg-m)

SECTION 4B

PROPELLER SHAFT

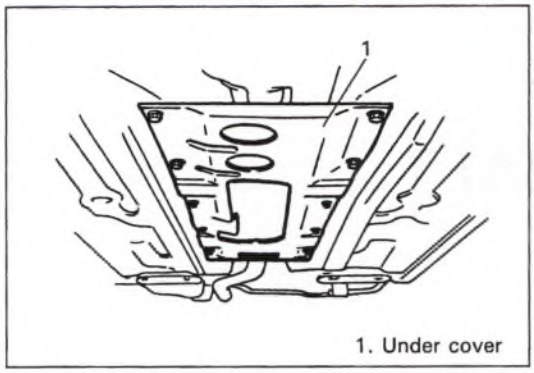
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ON-VEHICLE SERVICE

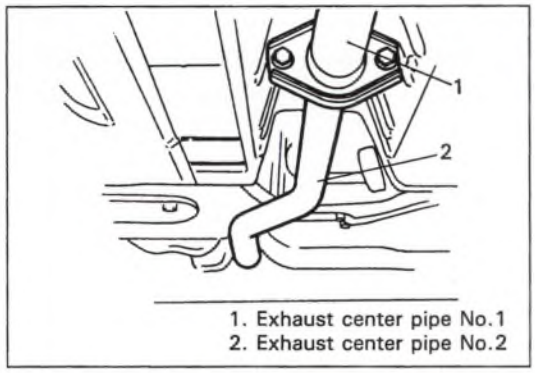
REMOVAL

1) Release parking brake and hoist vehicle.
2) Remove under cover.



1. Under cover

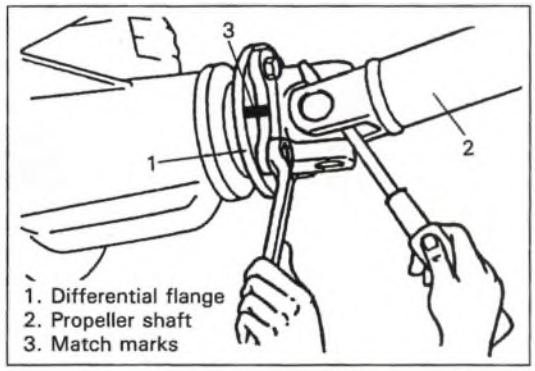
3) Remove exhaust center pipes No.1 and No.2
4) Remove floor tunnel cover.



1. Exhaust center pipe No.1
2. Exhaust center pipe No.2

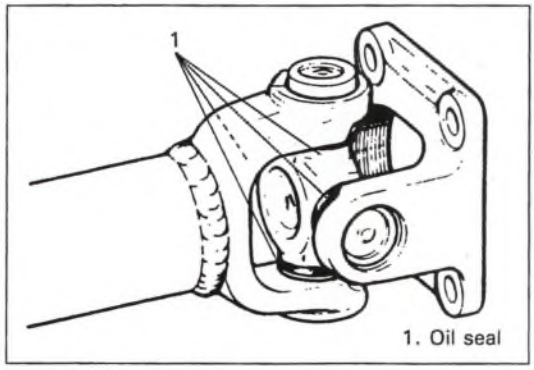
5) Remove propeller shaft from differential.
Lock propeller shaft with a proper size rod or such as shown and then loosen propeller shaft bolts.

NOTE:
Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown.



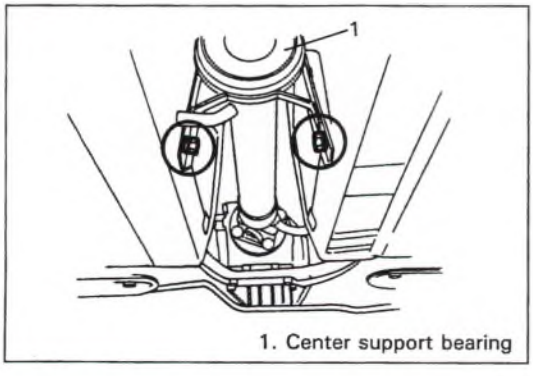
1. Differential flange
2. Propeller shaft
3. Match marks

CAUTION:
When inserting a proper size rod or the like into cross joint to secure propeller shaft, use care not to break seal used for joint. Broken seal will cause joint to run out of oil or function poorly.

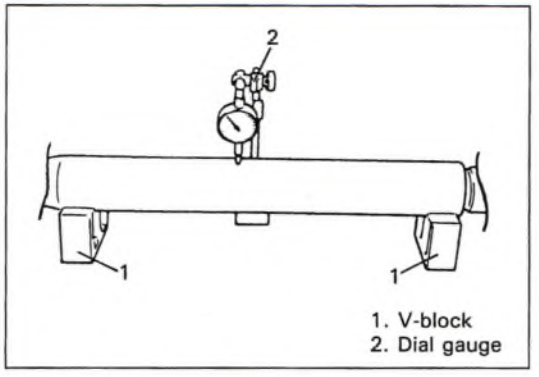


1. Oil seal

6) Remove center support bearing from body.
7) Disconnect propeller shaft from transmission.



1. Center support bearing



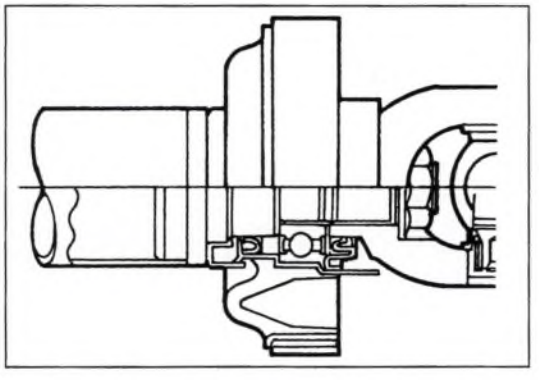
1. V-block
2. Dial gauge

INSPECTION

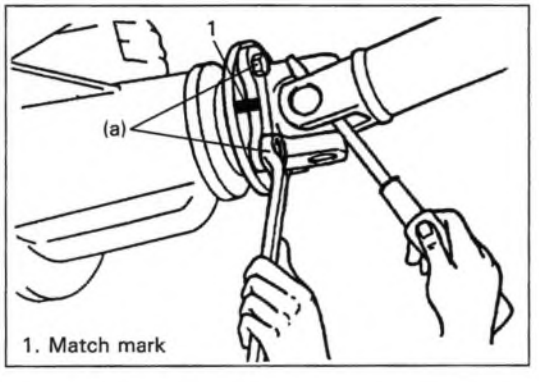
- Inspect propeller shaft for runout by using dial gauge and V-block.

 Runout limit: 1.0 mm

 If shaft runout exceeds its limit, replace propeller shaft assembly.



- Inspect yoke and center support bearing for damage, rattle and smooth movement.
 If found defective, replace propeller shaft assembly.



1. Match mark

INSTALLATION

Install in reverse order of removal procedure noting following points.

- If transmission oil was drained for propeller shaft removal, pour specified gear oil into transmission case to specified level. (Refer to SECTION 7A.)
- When installing propeller shaft, align match marks. Otherwise, vibration may occur during driving.

 Tightening Torque
 (a): 18—21 N·m (1.8—2.1 kg-m)

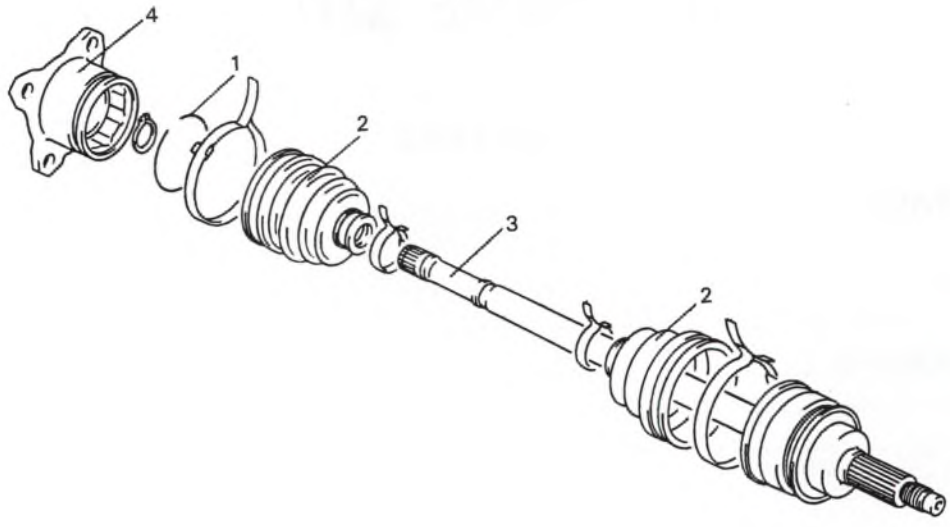
SECTION 4C

REAR DRIVE SHAFT

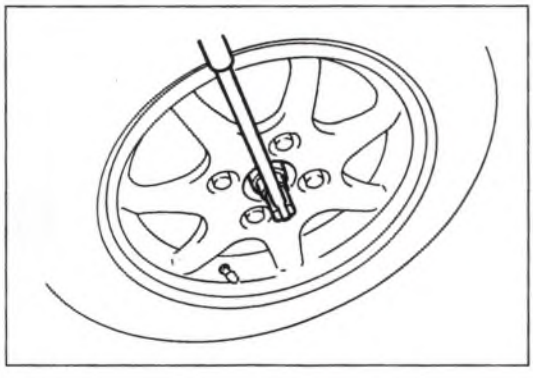
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ON-VEHICLE SERVICE

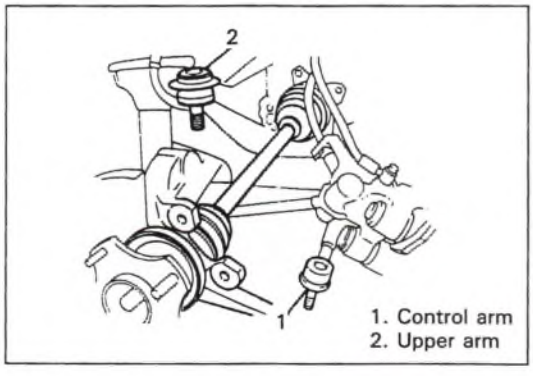


1. Circlip
2. Boot
3. Drive shaft
4. Flange



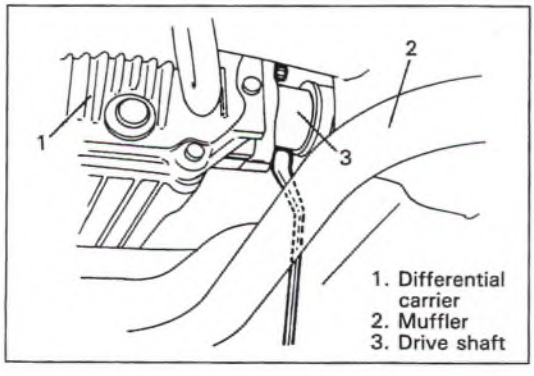
REMOVAL

1) Apply parking brake and loosen drive shaft nut.
2) Hoist vehicle and remove wheel.



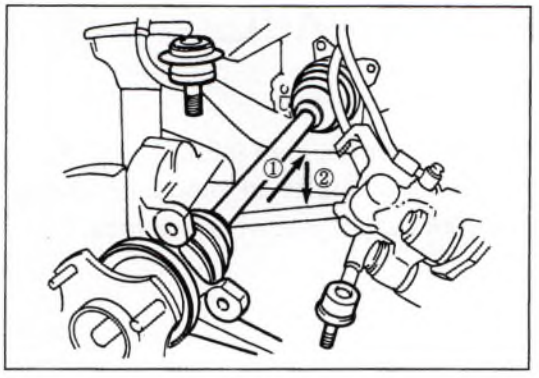
1. Control arm
2. Upper arm

3) Disconnect control arm and upper arm from knuckle.

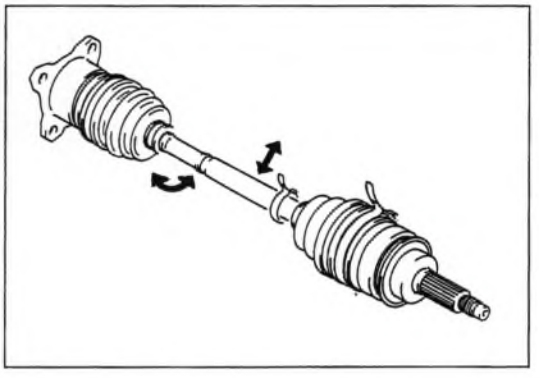


1. Differential carrier
2. Muffler
3. Drive shaft

4) Detach drive shaft from differential.

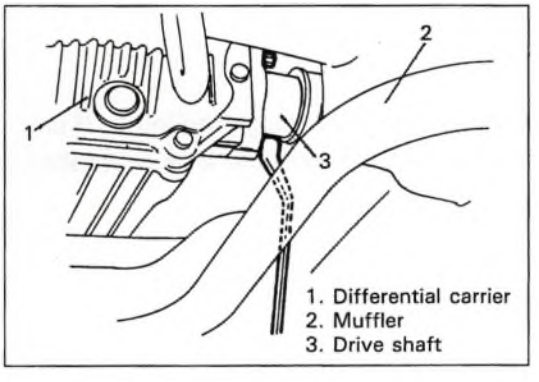


5) Remove drive shaft from body and knuckle as shown in left figure.



INSPECTION

- Check that drive shaft joint moves smoothly.
- Check boots for breakage or deterioration. Replace them as necessary.
- Check circlip, snap ring and boot band for breakage or deformation. Replace as necessary.



INSTALLATION

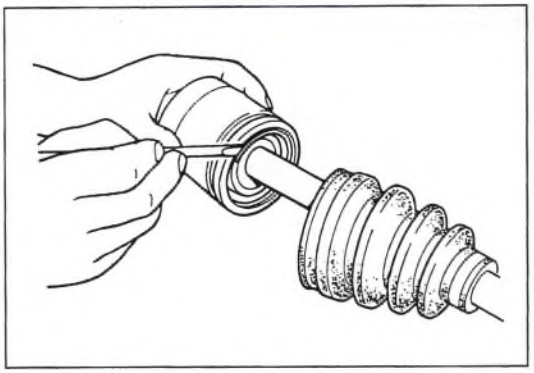
Install in reverse order of removal procedure noting following points.

- Tighten drive shaft nut and differential flange bolt to specified torque.

Tightening Torque

Drive shaft nut : 40—60 N·m (4.0—6.0 kg-m)
Differential flange bolt: 40—60 N·m (4.0—6.0 kg-m)

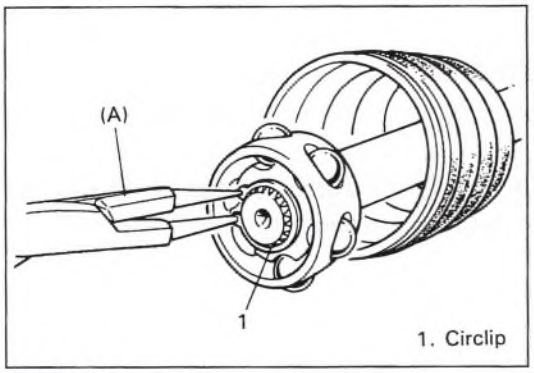
- For suspension arm installation, refer to SECTION 3E.



UNIT REPAIR OVERHAUL

DISASSEMBLY

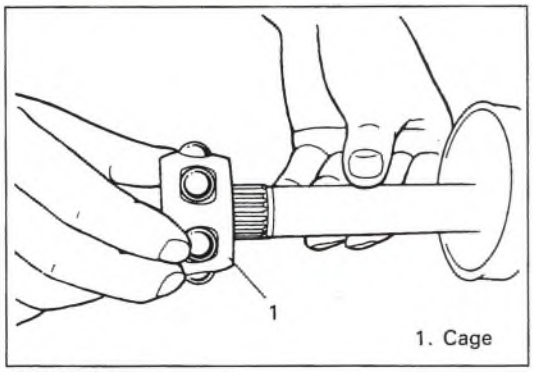
1) Remove boot band of differential side joint.
2) Slide boot toward the center of shaft and remove snap ring from outer race, then take shaft out of outer race.



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3) Wipe off grease and remove circlip used to fix cage by using special tool (A).

Special Tool
(A): 09900-06107



64B40-4-4-4

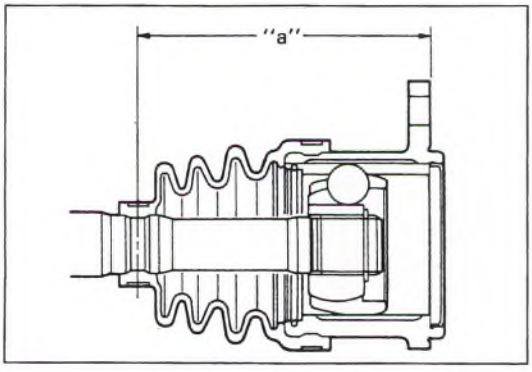
4) Draw away cage and boot from shaft.

NOTE:
Do not disassemble wheel side joint (outboard joint). If any malcondition is found in any joint, replace it as assembly.

REASSEMBLY

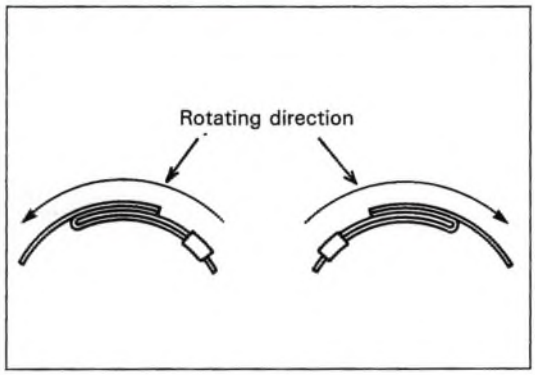
Reassemble in reverse order of disassembly procedure noting following points.

- Wash disassembled parts (except boots). After washing, dry them completely by blowing air.
- Clean boots with cloth. DO NOT wash them in degreaser, such as gasoline, kerosene, etc.
 Washing in degreaser will cause deterioration of boots.



- Apply grease to inside of outer race, and fit boot to outer race.
 After fitting boot, insert screw driver into boot on outer race side and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.
- When fixing boot to outer race with boot band, adjust so that measurement indicated as "a" in figure become as specified below.

Length "a": 111 mm



- Note that boot band must be installed in such direction as shown at the left.

SECTION 5

BRAKES

NOTE:
All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

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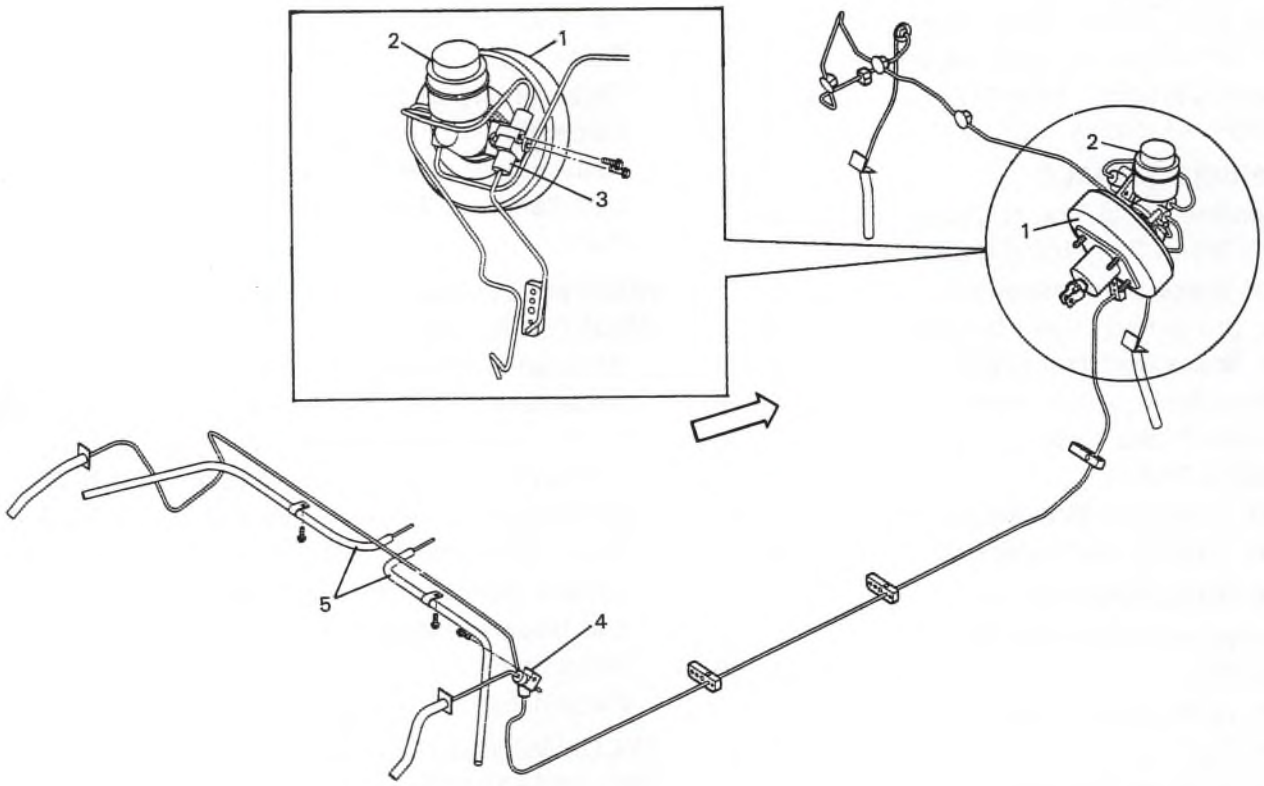
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GENERAL DESCRIPTION

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and two in rear).
The master cylinder is a tandem master cylinder. Three brake pipes are connected to the master cylinder and they make two independent circuits. One connects front brakes and the other connects rear brakes. The proportioning valve (P valve) is included in these circuits between the master cylinder and rear wheels.
In this brake system, the disc brake type is used for the front and rear wheel brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake pads are used for both parking and foot brakes.



1. Brake booster
2. Master cylinder
3. Proportioning valve
4. 2-way joint
5. Parking brake cable

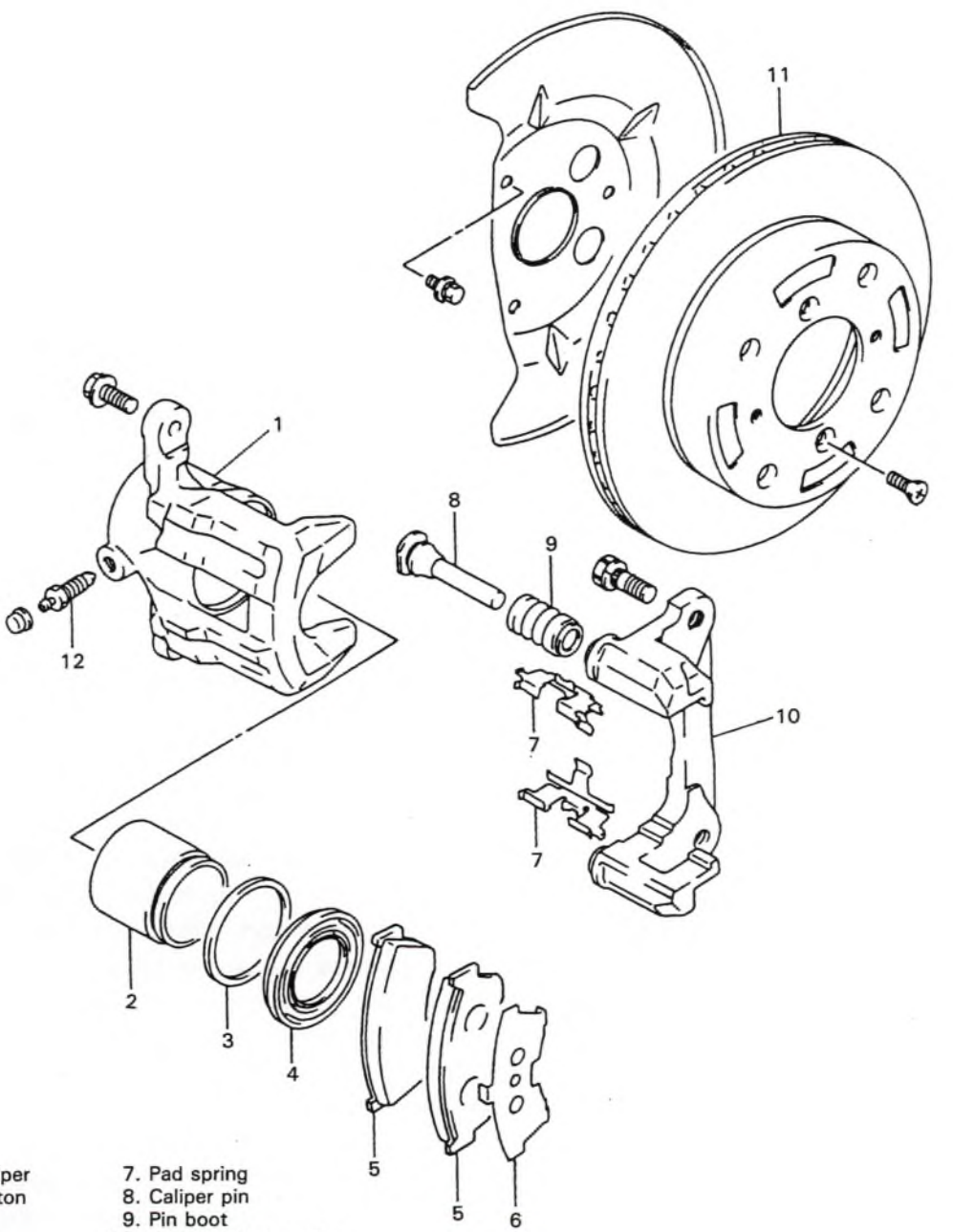
FRONT DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

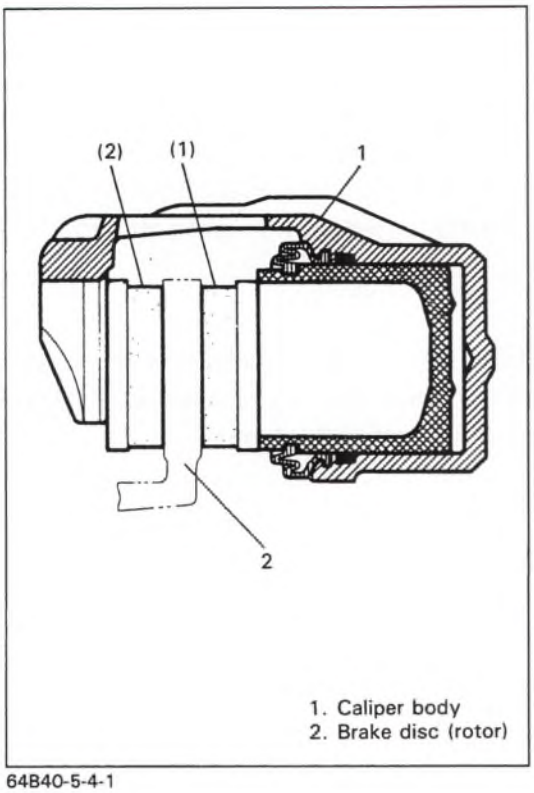
This caliper has a single bore. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (slide) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings) against the disc, creating friction to stop the car. For details, refer to OPERATION in the next page.

NOTE:

Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system. Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.



1. Disc brake caliper
2. Disc brake piston
3. Piston seal
4. Cylinder boots
5. Disc brake pad
6. Anti noise shim
7. Pad spring
8. Caliper pin
9. Pin boot
10. Brake caliper carrier
11. Brake disc
12. Bleeder plug



1. Caliper body
2. Brake disc (rotor)

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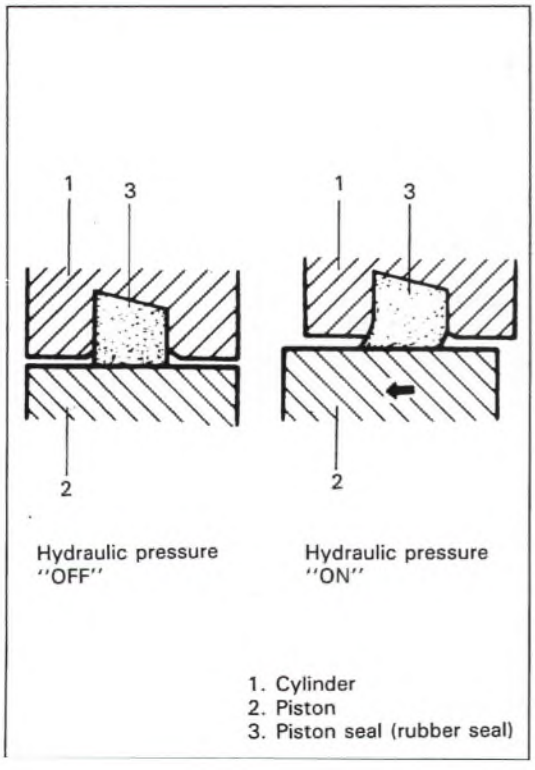
Caliper OPERATION

Single piston floating caliper type

The single piston floating caliper type brake is employed in this model. One cylinder and one piston are used for this type. (The cylinder is constructed as a monoblock with the caliper.) Fluid pressure generated in the cylinder causes the pad (1) on the piston side to press against the disc. At the same time, the floating type caliper body is moved to the right by the cylinder pressure, as shown in figure, which pulls pad (2) against the disc and so brakes the wheel.

The disc brake has no servo assistant as in drum braking, and it is necessary to increase the working pressure of the piston and pad. For this purpose, the wheel cylinder has a large bore. Even only a little change in clearance between the disc and pad has therefore a large influence on the brake pedal stroke. It is necessary to keep the clearance adjusted to the minimum at all times, by means of the piston (rubber) seal.

64B40-5-4-3



1. Cylinder
2. Piston
3. Piston seal (rubber seal)

Clearance correction

When oil pressure is applied to the piston, the piston moves forward. The rubber seal, which exerts considerable pressure against the piston, moves with the cylinder. However, as a part of the rubber seal has been fixed into a groove in the cylinder, the shape of the rubber seal is distorted toward internal end of the cylinder, as shown in left figure. When pressure is taken off from the foot brake pedal and fluid pressure is released from the piston, a restoring force is generated at the seal and pushes the piston back.

As the pads wear away and the clearance between the disc and pads becomes larger, the piston moves a larger distance. The seal then could change in shape further but, since the end of the seal is fixed into the groove in the cylinder, the distortion is limited to the same amount as previously described. The piston moves further to cover the distance of clearance. The piston returns by the same distance and the rubber seal recovers its shape as described above and thus the clearance between the disc and pads is maintained in adjustment.

REAR DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

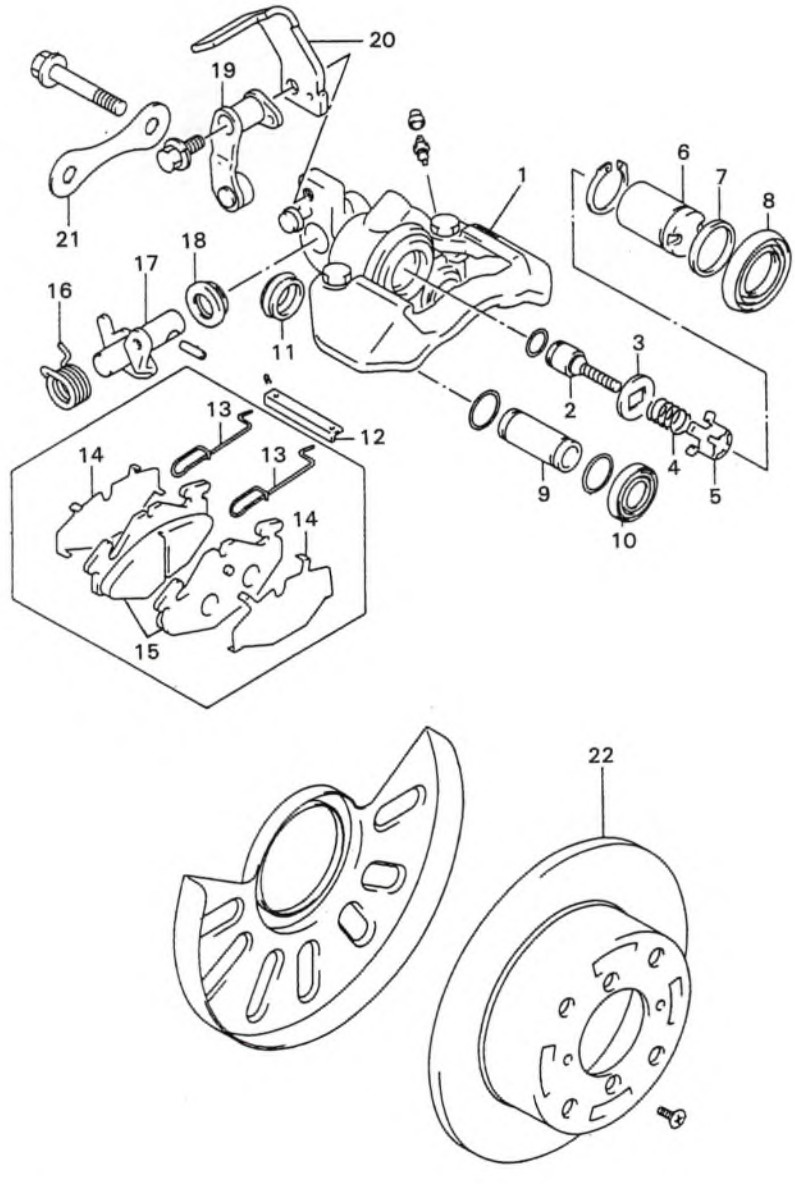
This caliper assembly is a single piston floating caliper type. It consists of such components as shown below and serves as foot brake and parking brake.

NOTE:

Replace all components included in repair kits to service this disc brake. Lubricate parts as specified.

WARNING:

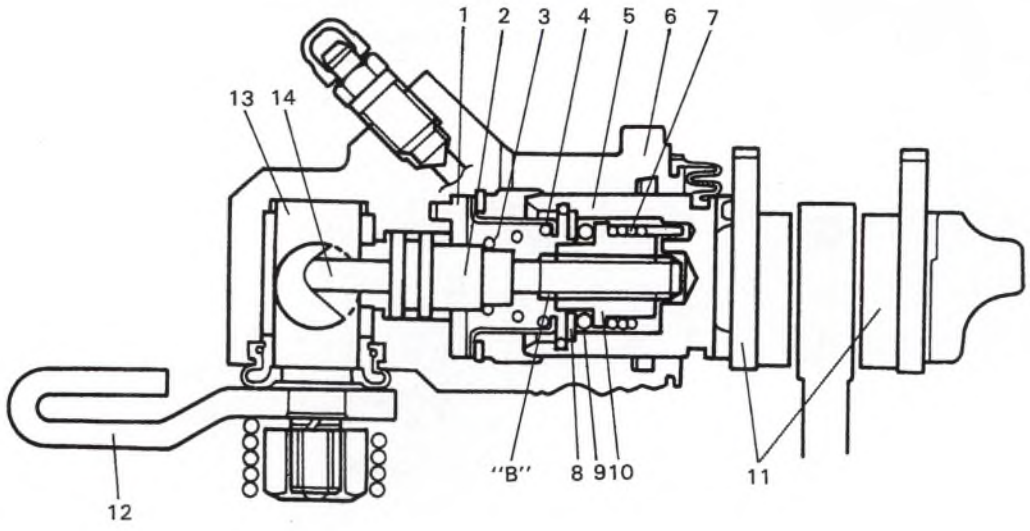
If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.



1. Brake caliper
2. Adjusting bolt
3. Lock plate
4. Return spring
5. Spring seat
6. Piston
7. Piston seal
8. Piston boot
9. Disc brake sleeve
10. In sleeve boot
11. Out sleeve boot
12. Key
13. Pad spring
14. Anti noise shim
15. Pad
16. Lever spring
17. Toggle shaft
18. Shaft boot
19. Support
20. Wire guide
21. Anti rotation plate
22. Brake disc

STRUCTURE

As shown below, the piston has a adjust block, bearing and spring in it. The adjust block is pushed against the bearing by the spring.
The thread (''B'' in the figure) on the adjust bolt is engaged with the adjust block and the coil spring force is applied to the push rod, which then pushes the rod toward the toggle shaft.
As the adjust bolt is tightly fitted with the lock plate, it can not turn.

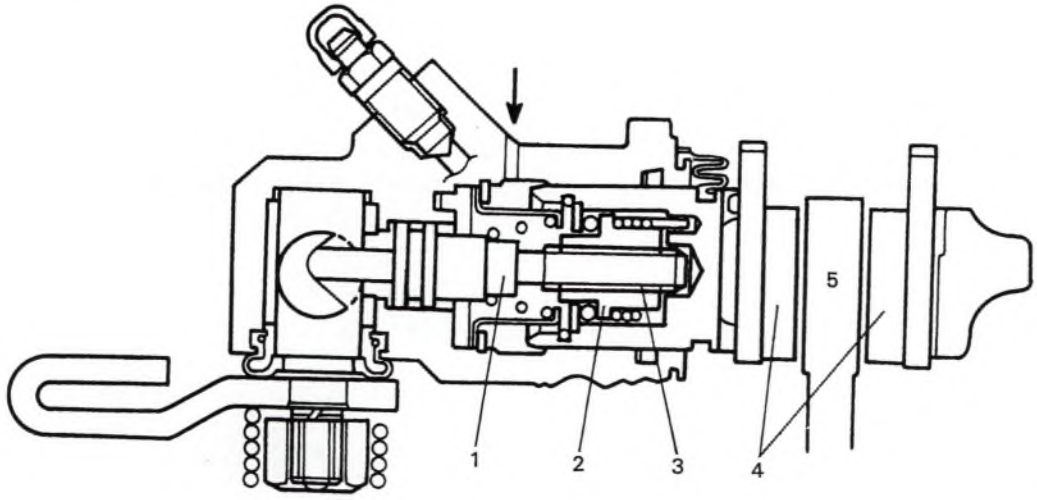


1. Lock plate
2. Adjust bolt
3. Spring
4. Spring seat
5. Piston
6. Caliper body
7. Spring
8. Bearing seat
9. Ball bearing
10. Adjust block
11. Brake pad
12. Parking lever
13. Toggle shaft
14. Toggle pin

OPERATION

[Foot brake]

When the brake pedal is depressed, the hydraulic pressure generated in the master cylinder makes the adjust block in the caliper (cylinder) and piston move in the rod direction by the amount of built in clearance at the thread of the adjust bolt. As the adjust block does not turn in this state, it does not act as an automatic adjust device.
When the disc-to-pad clearance grows larger and exceeds the built in clearance at the thread of the adjust bolt, the piston moves away from the adjust block in the rod direction (to the right in the figure). Then due to the screw torque (which causes the adjust block to turn) generated by the hydraulic pressure, the adjust block turns and moves in the rod direction for adjustment till adjust bolt thread-to-adjust block thread clearance is gone.
For the process after the piston has moved to the right till the brake force occurs, refer to the description under FRONT BRAKE in this section.
When the foot is taken off the brake pedal and the hydraulic pressure in the brake system lowers, the piston in the caliper moves back with the help of the piston seal and coil spring for the proper pad-to-disc clearance.
This clearance is determined by the built in clearance generated between the adjust block and the thread of the adjust bolt.



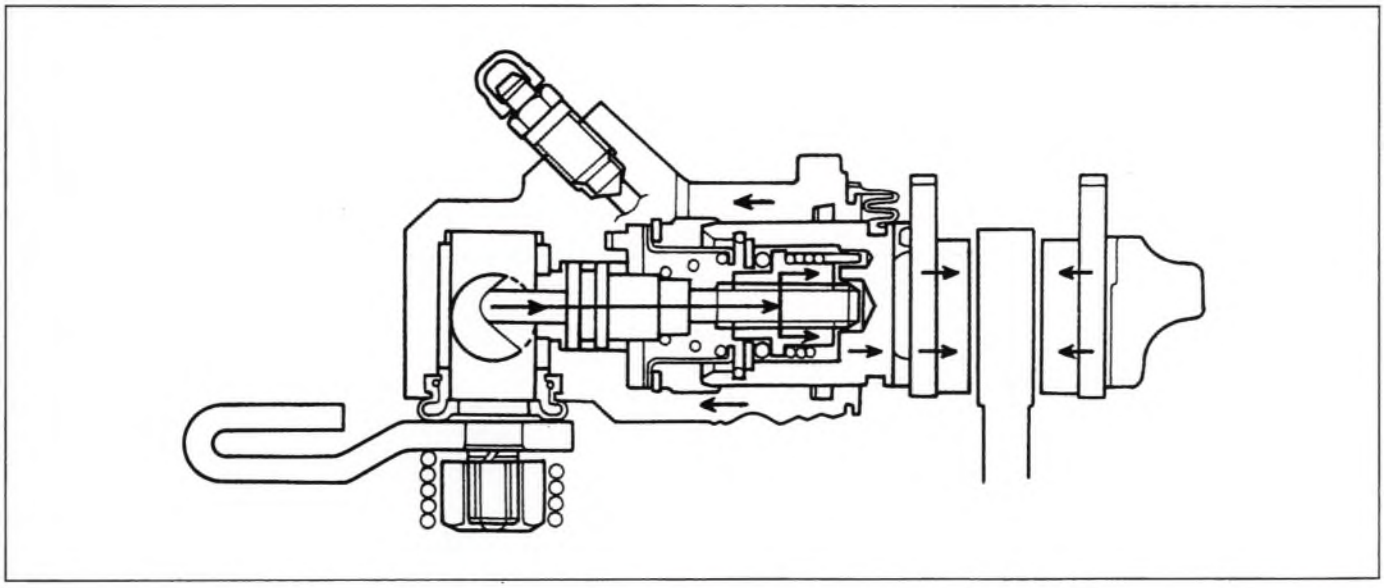
1. Adjust bolt
2. Adjust block
3. Thread
4. Pad
5. Disc

[Parking brake]

When the parking brake lever is pulled up, it causes the lever on the rear brake caliper to move (rotate) through the cable.

As the lever is made a part of the toggle shaft which is installed in the brake caliper (cylinder), the toggle shaft follows the lever movement.

As shown in the figure, the toggle shaft has a cam (eccentric hole in a cone form), thereby the toggle shaft movement (rotation) is converted into the linear movement of the push rod in the rod direction through the rod.

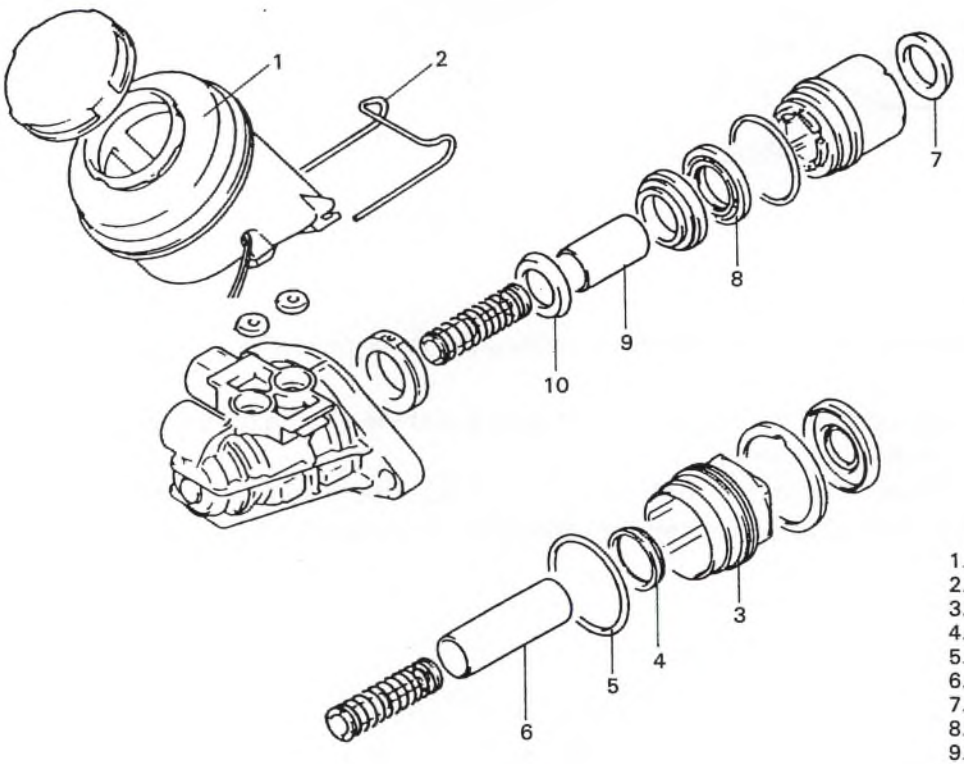


MASTER CYLINDER ASSEMBLY

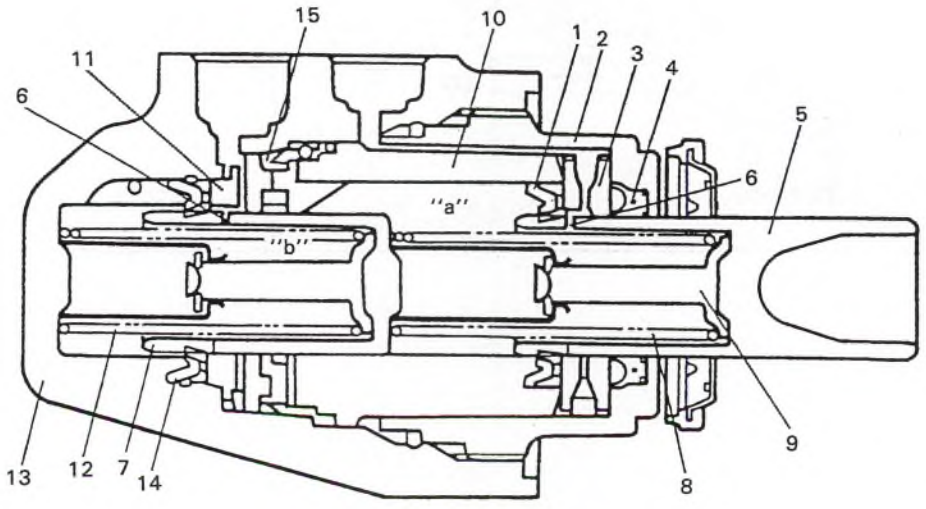
GENERAL DESCRIPTION

The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary (''a'' in the below figure) and secondary (''b'') chambers. The hydraulic pressure produced in the primary chamber (''a'') acts on the rear wheel brakes (left and right).

Also, the hydraulic pressure produced in the secondary chamber (''b'') acts on the front wheel brakes (left and right).



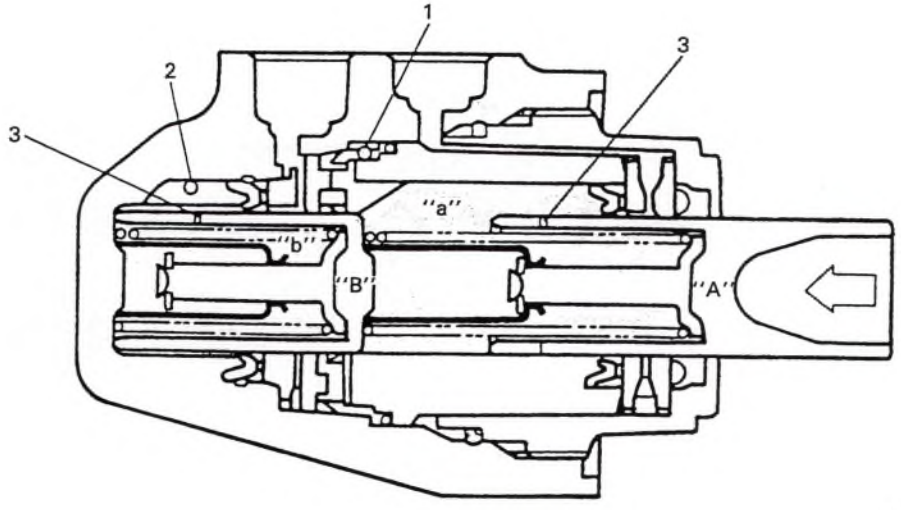
1. Reservoir tank
2. Retainer
3. Cap
4. Cup
5. O-ring
6. Primary piston
7. Primary cup
8. Pressure cup
9. Secondary piston
10. Secondary cup



1. Primary cup
2. Cap
3. Primary piston guide
4. Cup
5. Primary piston
6. Relief port
7. Secondary piston
8. Primary return spring
9. Retainer spring
10. Sleeve
11. Secondary piston guide
12. Secondary return spring
13. Cylinder body
14. Secondary cup
15. Pressure cup

Master Cylinder OPERATION

Depressing the brake pedal forces the primary piston "A" to move to the left in the below figure and consequently the hydraulic pressure is produced in the chamber "b".
By means of this pressure and the return spring force, the secondary piston "B" is also pushed to the left and thus the hydraulic pressure is produced in the chamber "a".



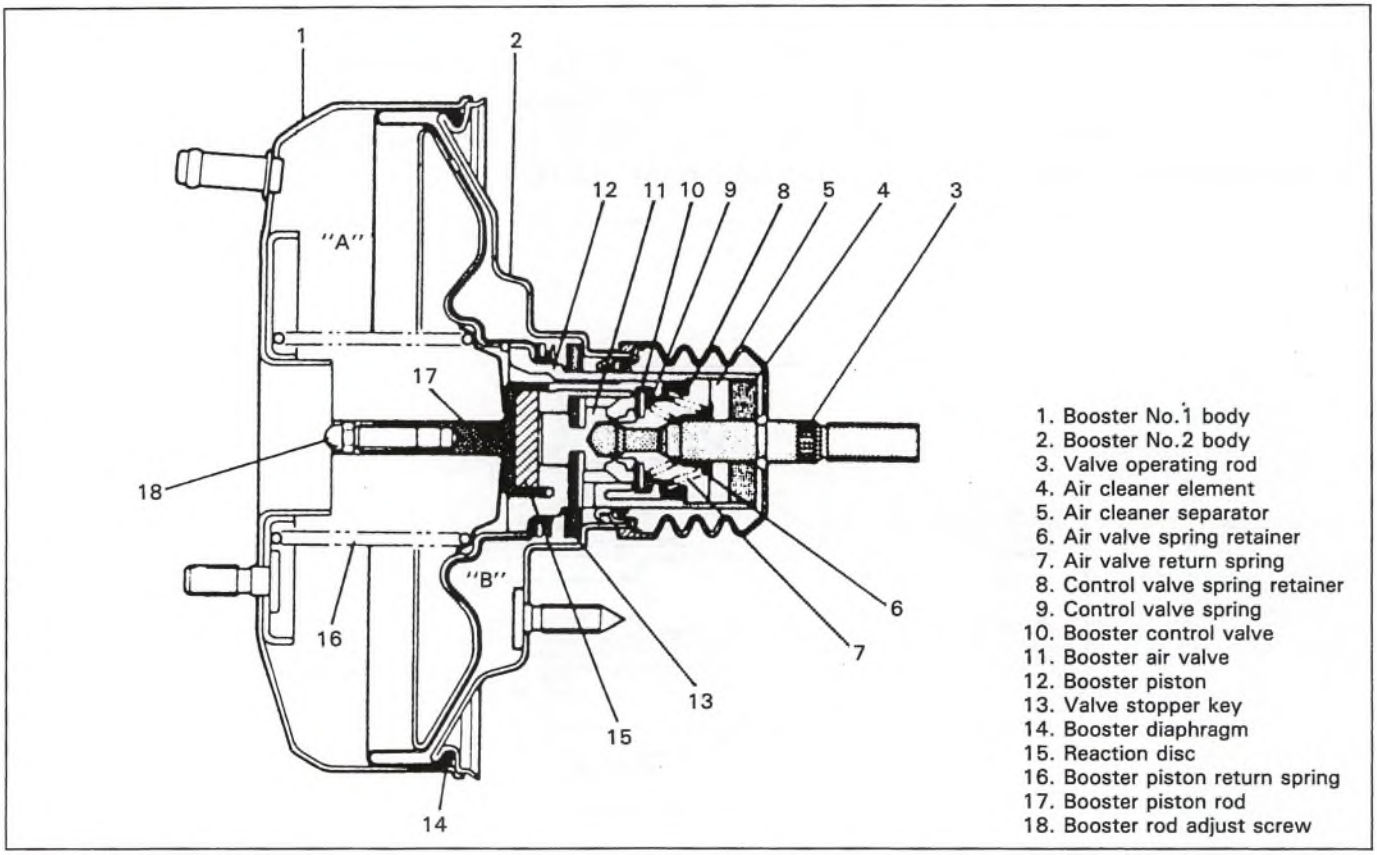
1. Port (to front brakes)
2. Port (to rear brakes)
3. Relief port

BOOSTER ASSEMBLY

GENERAL DESCRIPTION

The booster is located between the master cylinder and the brake pedal. It is so designed that the force created when the brake pedal is depressed is mechanically increased combined with the engine vacuum. The booster has a diaphragm of ∅ 7 in. effective diameter. Its operation is described in the following.

WARNING:
Never disassemble brake booster assembly. If it is found faulty, replace it with new assembly.

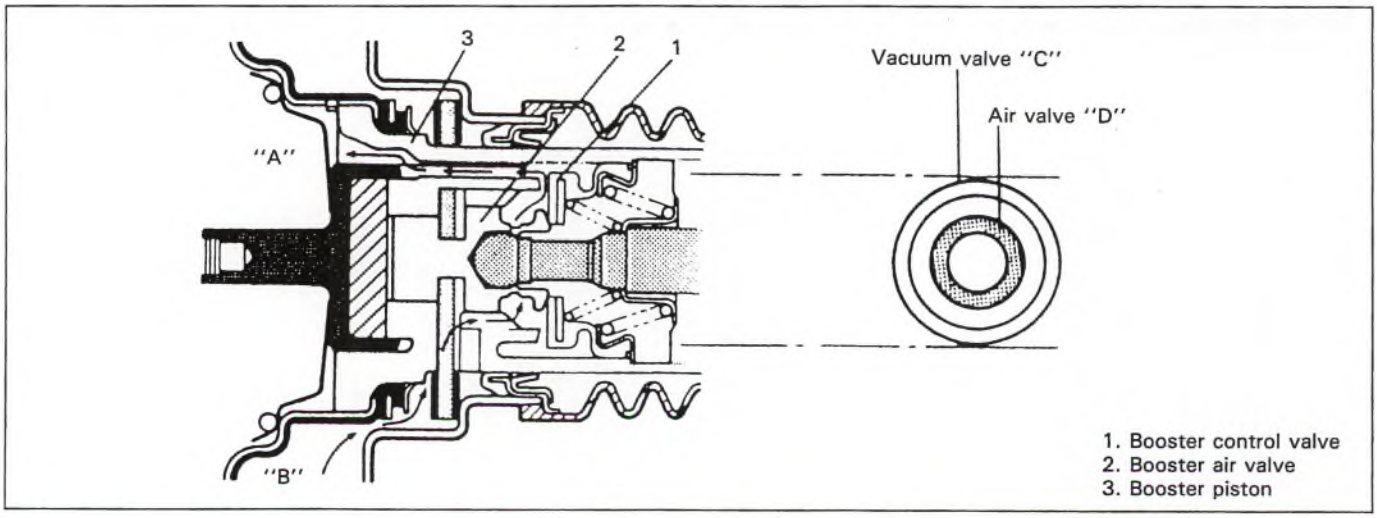


1. Booster No.1 body
2. Booster No.2 body
3. Valve operating rod
4. Air cleaner element
5. Air cleaner separator
6. Air valve spring retainer
7. Air valve return spring
8. Control valve spring retainer
9. Control valve spring
10. Booster control valve
11. Booster air valve
12. Booster piston
13. Valve stopper key
14. Booster diaphragm
15. Reaction disc
16. Booster piston return spring
17. Booster piston rod
18. Booster rod adjust screw

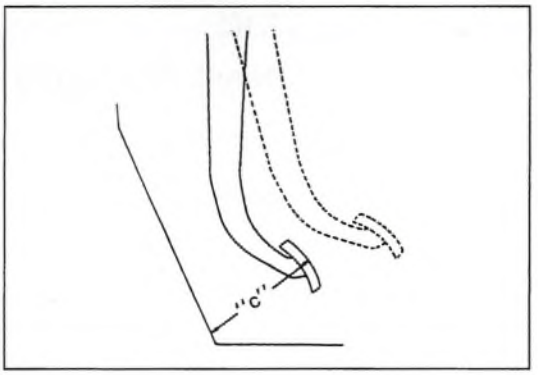
Booster OPERATION

When the brake pedal is depressed, the force is transmitted to the piston of the master cylinder through the valve operating rod, booster air valve, reaction disc and piston rod. At the same time, the force of the booster piston developed due to the pressure difference between the two chambers "A" and "B" in the above figure is added to it.

The end of the booster control valve has a double function of a vacuum valve and air valve. That is, as shown in the figure, the booster control valve closes between the "A" and "B" chambers as its outer end "C" contacts the booster piston seat and opens as "C" leaves the booster piston seat (vacuum valve function). Also it closes between the "B" chamber and outside air as its inner end "D" contacts the air valve seat and opens as "D" leaves the air valve seat (air valve function).



1. Booster control valve
2. Booster air valve
3. Booster piston



ON-VEHICLE SERVICE

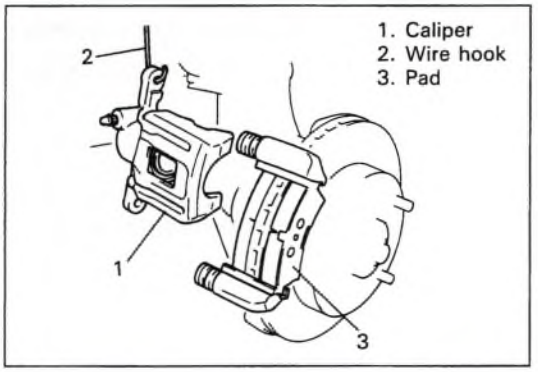
EXCESSIVE PEDAL TRAVEL CHECK

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 30 kg load, measure pedal arm to wall clearance "c". It mustn't be less than 100 mm.

Clearance "c": 100 mm

4) If clearance "c" is less than 100 mm, the most possible cause is air is in lines.
 Should clearance "c" remain less than 100 mm even after bleeding of system, other possible but infrequent cause is booster push rod length out of adjustment for the vehicle with brake booster.

• See page 5-14 for bleeding brake system.



FRONT BRAKE PAD LINING INSPECTION

1) Hoist vehicle and remove wheel.
2) Remove caliper pin bolts.
3) Remove caliper from caliper carrier.

NOTE:
Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with caliper removed.

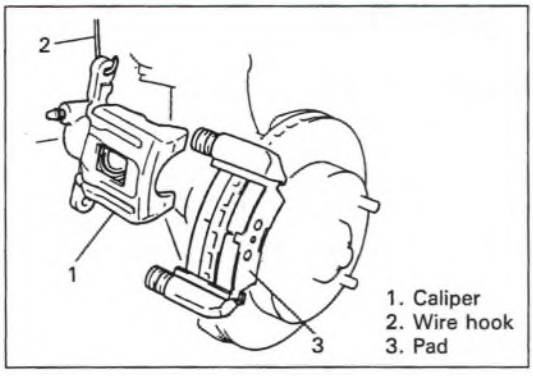
4) Remove pads.

Check pad lining for wear. When wear exceeds limit, replace with new one.

CAUTION:
Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Pad thickness (lining + pad rim) Standard: 15.0 mm
Limit : 8.0 mm

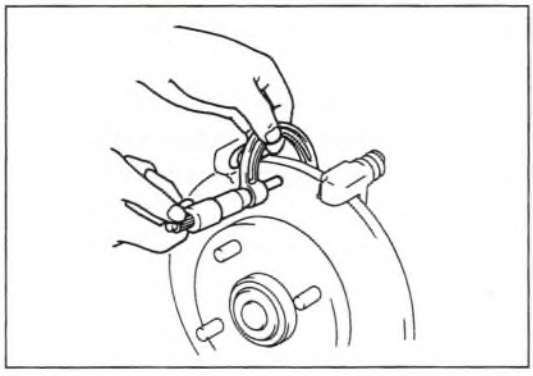
NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



1. Caliper
2. Wire hook
3. Pad

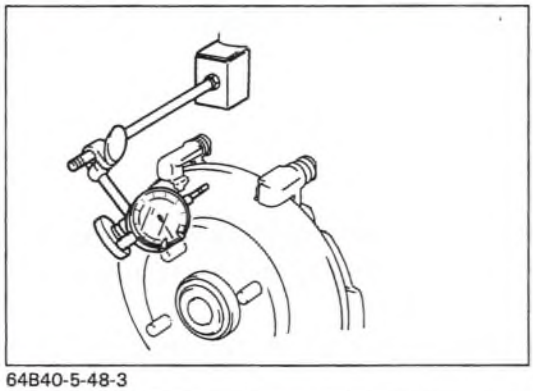
FRONT BRAKE DISC INSPECTION

Remove pads referring to item FRONT BRAKE PAD LINING INSPECTION.



Check disc surface for scratches in wearing parts.
Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious.
But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratches, polish and correct that side.

Disc thickness Standard: 17.0 mm
Limit : 15.0 mm

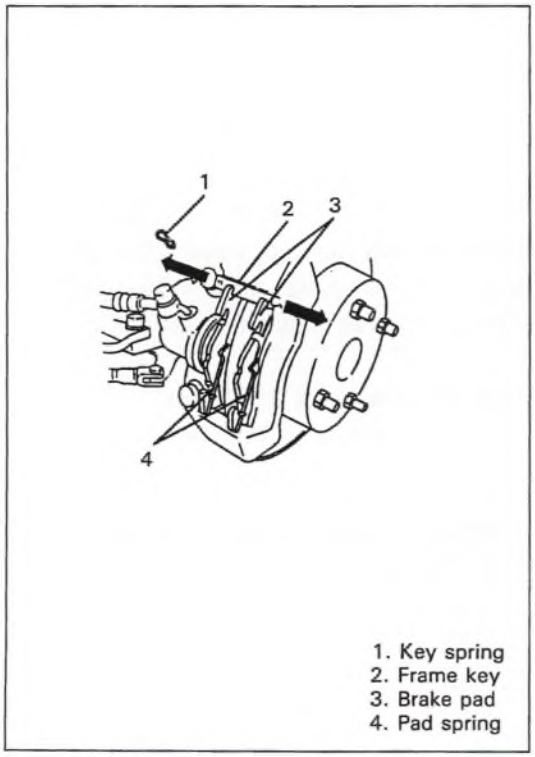


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To measure deflection of disc, take measurement at 2 points on its periphery and center with dial gauge while rotating it.

Limit on disc deflection: 0.15 mm

NOTE:
Check wheel bearing for looseness before measurement.



1. Key spring
2. Frame key
3. Brake pad
4. Pad spring

REAR BRAKE PAD LINING INSPECTION

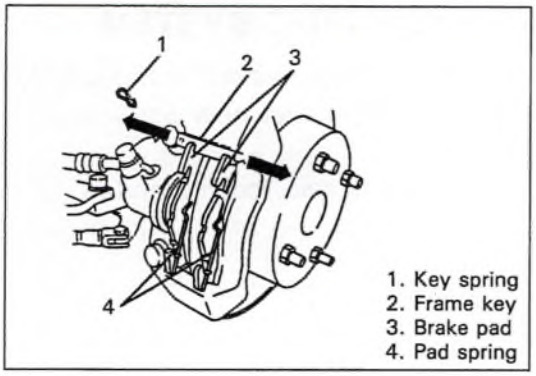
1) Hoist vehicle and remove wheel.
2) Remove pads by removing key spring and frame key.

Check pad lining for wear. When wear exceeds limit, replace with new one.

CAUTION:
Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Pad thickness (lining + pad rim) Standard: 12.5 mm
Limit : 6.5 mm

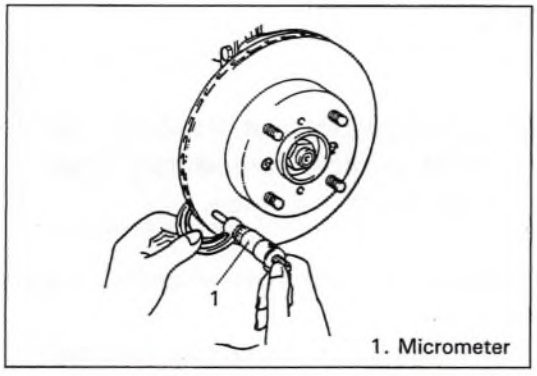
NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



1. Key spring
2. Frame key
3. Brake pad
4. Pad spring

REAR BRAKE DISC INSPECTION

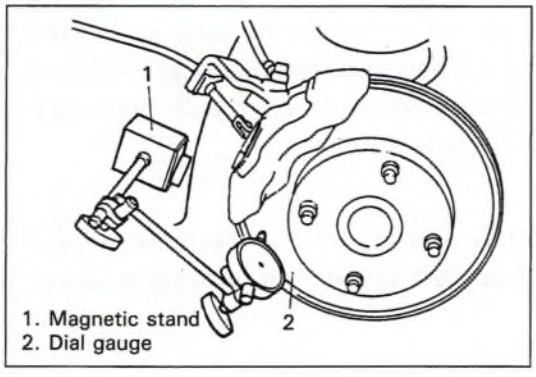
1) Remove pads referring to item REAR BRAKE PAD LINING INSPECTION.
2) Remove rear brake caliper by removing caliper pin bolt.



1. Micrometer

3) Check disc surface for scratches in wearing parts.
Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious.
But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratches, polish and correct that side.

Disc thickness Standard: 10 mm
Limit : 8 mm



1. Magnetic stand
2. Dial gauge

4) To measure deflection of disc, take measurement at 2 points on its periphery and center with dial gauge while rotating it.

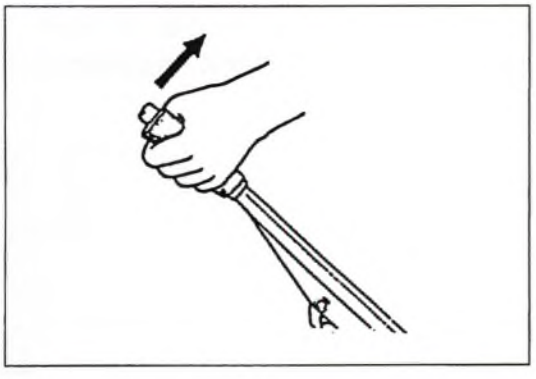
Limit on disc deflection: 0.15 mm

NOTE:
Check wheel bearing for looseness before measurement.

PARKING BRAKE ADJUSTMENT

NOTE:
Make sure for following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Brake pedal has been depressed a few times with about 30 kg load.**
- **Parking brake lever has been pulled up a few times with about 20 kg force.**
- **Rear brake pads are not worn beyond limit.**
- **To slacken parking brake cable, loosen adjusting nut as far as end of bolt. Then depress brake pedal a few times with about 30 kg load.**



After confirming that above 6 conditions are all satisfied, adjust parking brake lever stroke by tightening adjusting nut.

NOTE:
Check brake disc for dragging after adjustment.

Parking brake stroke: when lever is pulled up at 20 kg	Within 3—8 notches

FLUSHING BRAKE HYDRAULIC SYSTEM

It is recommended that entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in hydraulic system.
Periodical change of brake fluid is also recommended.

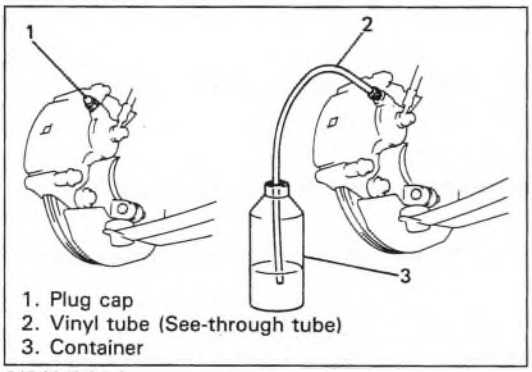
BLEEDING BRAKES

CAUTION:
Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder or other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at all 4 wheel brakes.

NOTE:
Perform bleeding operation starting with rear left caliper and then rear right caliper, front left caliper and front right caliper in that order.

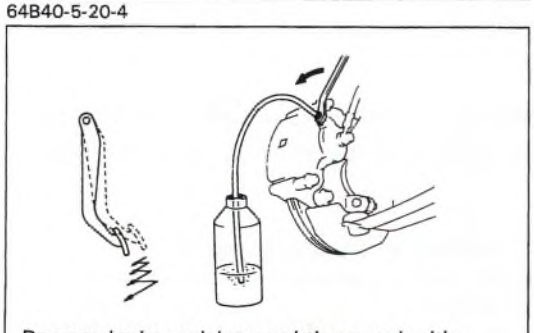
64B40-5-20-1



1. Plug cap
2. Vinyl tube (See-through tube)
3. Container

1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2) Remove bleeder plug cap.
 Attach a vinyl tube to bleeder plug of wheel cylinder, and insert the other end into container.

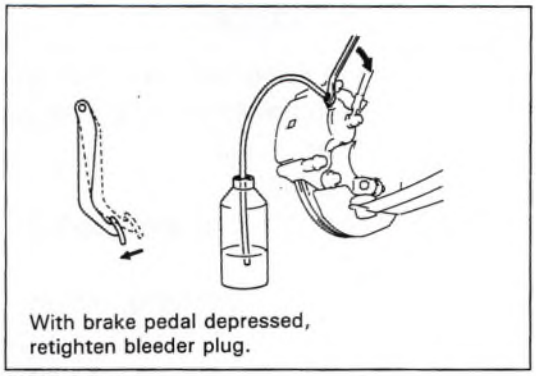
64B40-5-20-4



Depress brake pedal several times and with pedal depressed, loosen bleeder plug a little.

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.

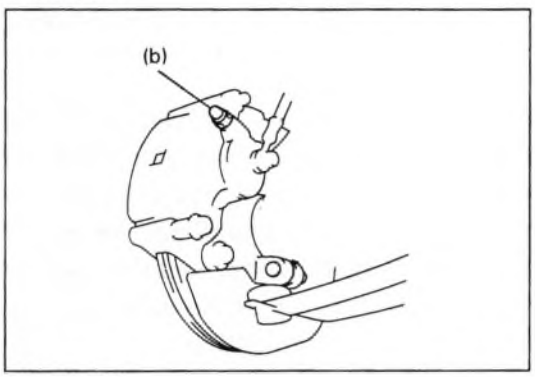
64B40-5-20-5



With brake pedal depressed, retighten bleeder plug.

64B40-5-21-1

4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.

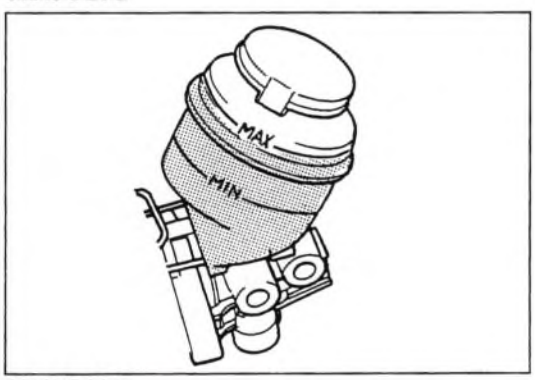


64B40-5-21-2

6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

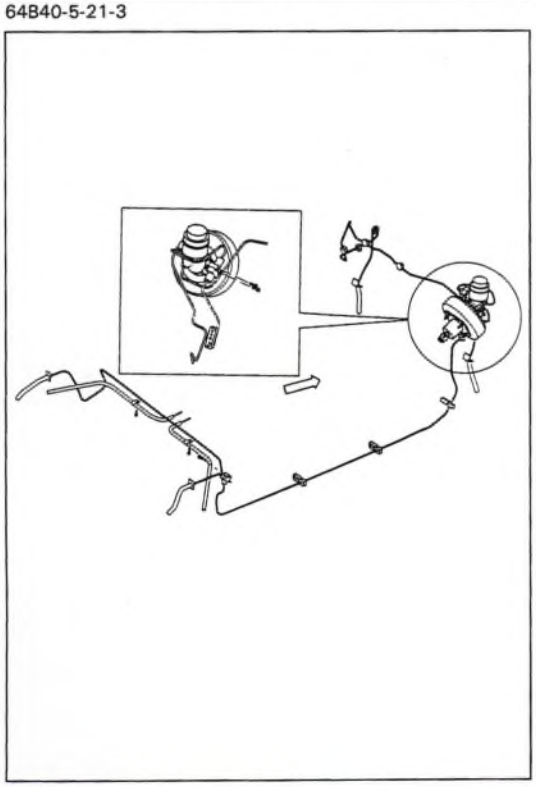
Tightening Torque
(b): 7—10 N·m (0.7—1.0 kg-m)

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.



64B40-5-21-3

9) Replenish fluid into reservoir up to specified level.
10) Check brake pedal for ''sponginess''. If found spongy, repeat entire procedure of bleeding.



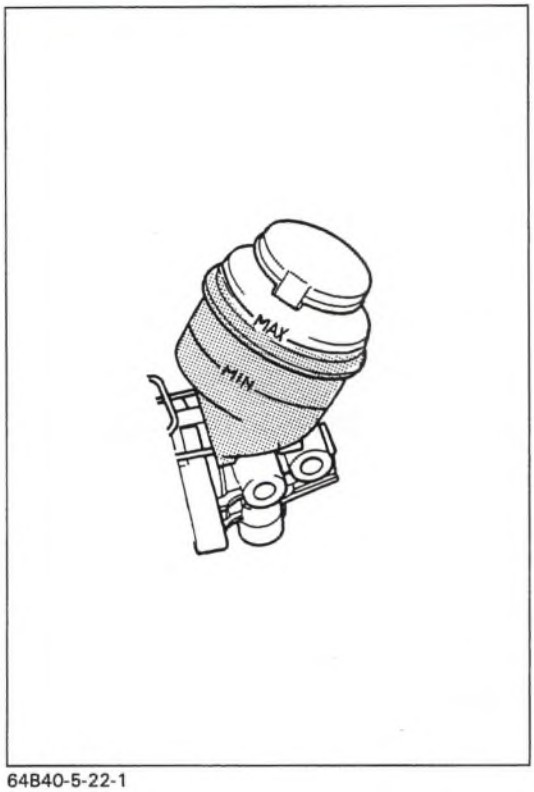
BRAKE HOSE AND PIPE INSPECTION

HOSE

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of the outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any of the above conditions are observed on the brake hose, it is necessary to replace it.

PIPE

Inspect the pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.



64B40-5-22-1

BRAKE FLUID LEVEL INSPECTION

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner's manual which comes along with that vehicle.
Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When warning light lights sometimes during driving, replenish fluid to MAX line.
When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

BRAKE HOSE/PIPE R & I

REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

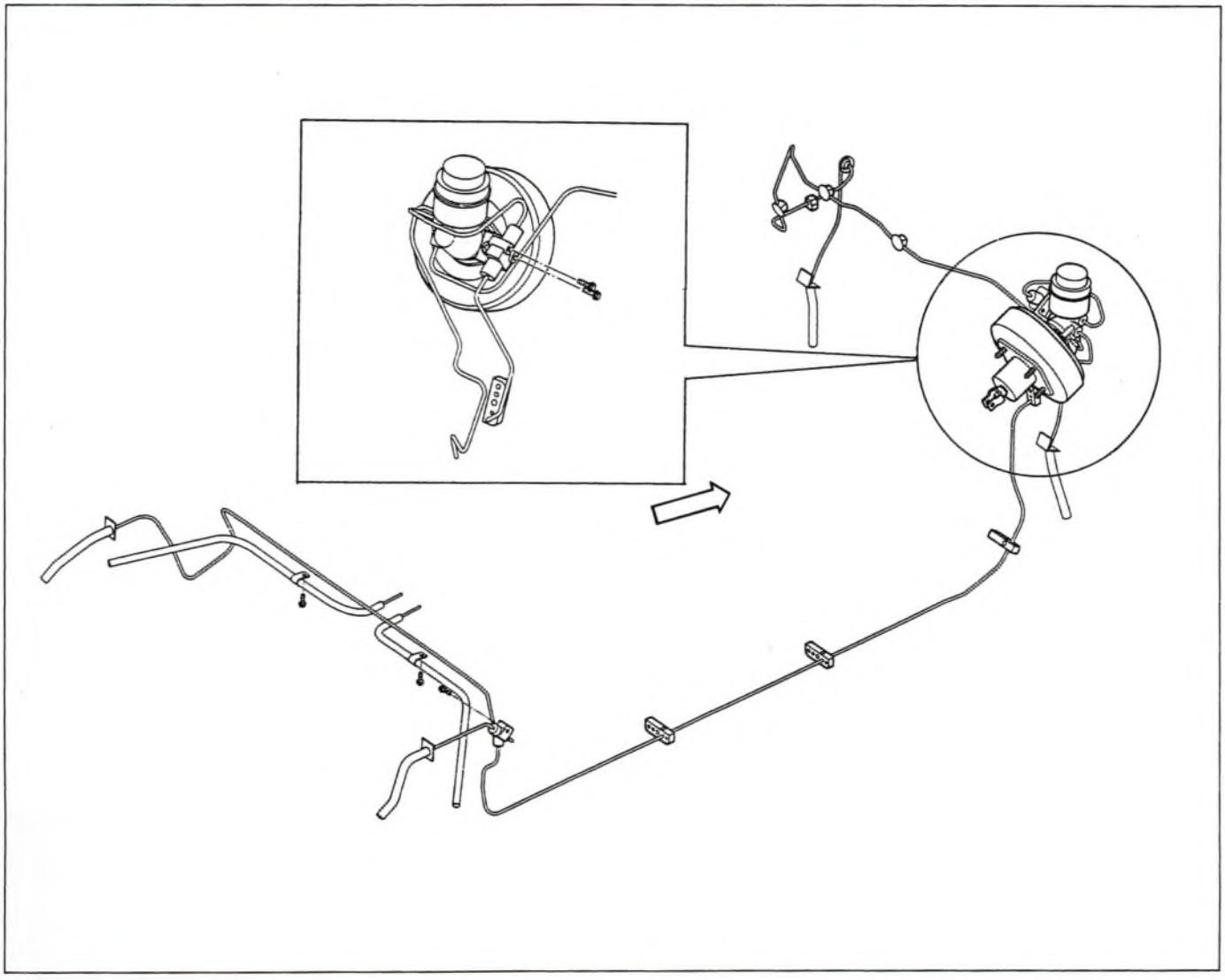
1) Raise and suitably support vehicle. Remove tire and wheel.
 This operation is not necessary when removing pipes connecting master cylinder and P valve.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse brake hose installation procedure.
 For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.

REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

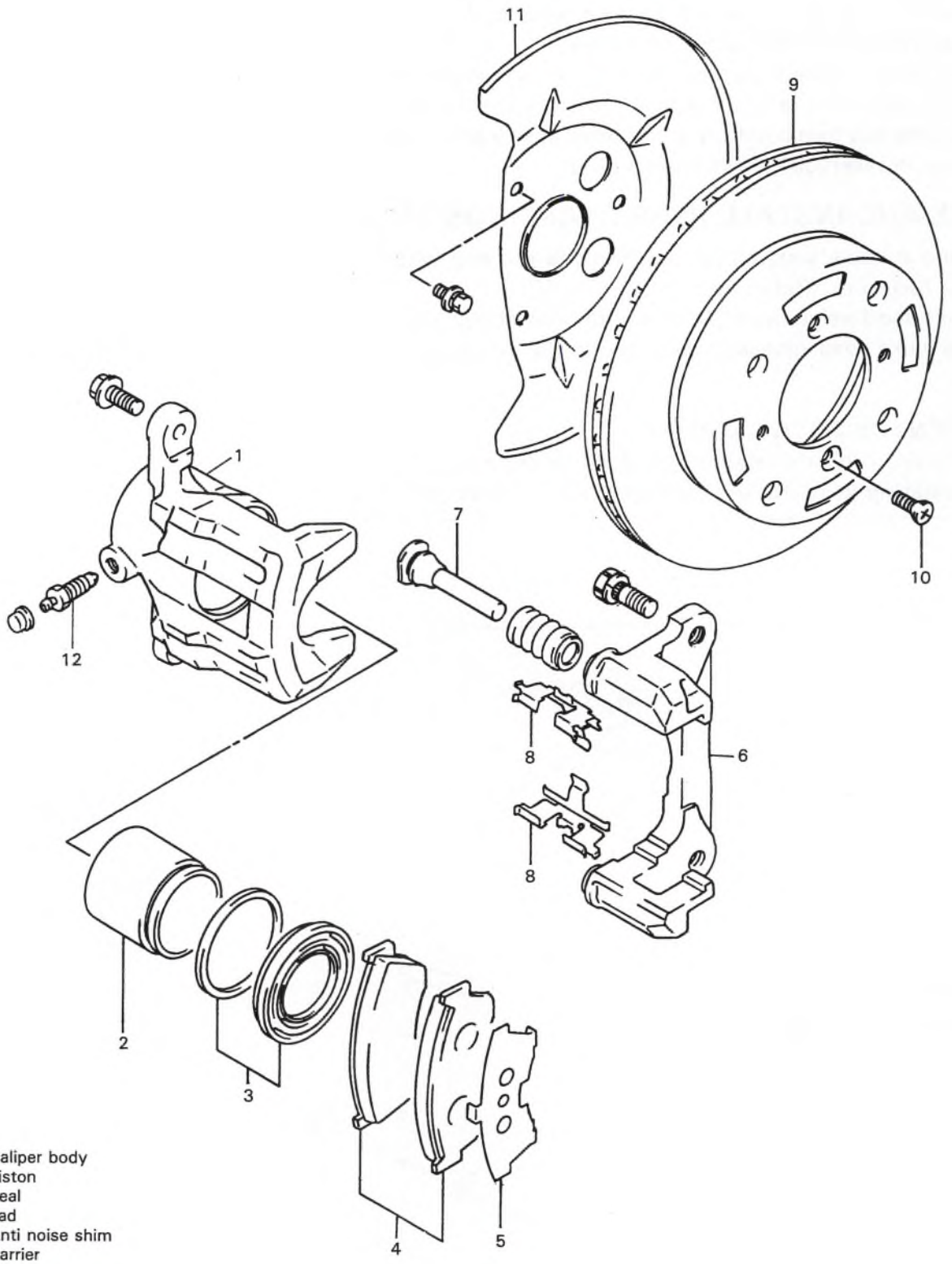
1) Raise and suitably support vehicle. Remove tire and wheel.
2) Remove fuel tank. (Referring to SECTION 6C)
3) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
4) Reverse brake hose installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.

PRECAUTION FOR INSTALLATION

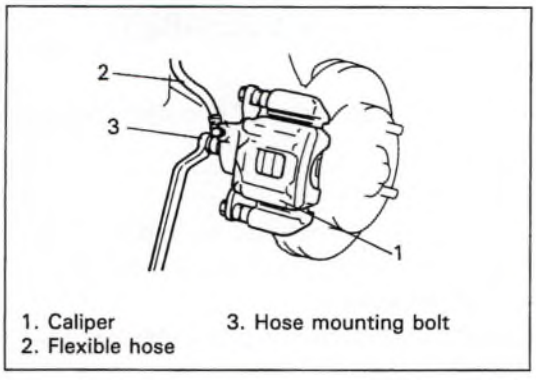
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.



FRONT DISC BRAKE R & I



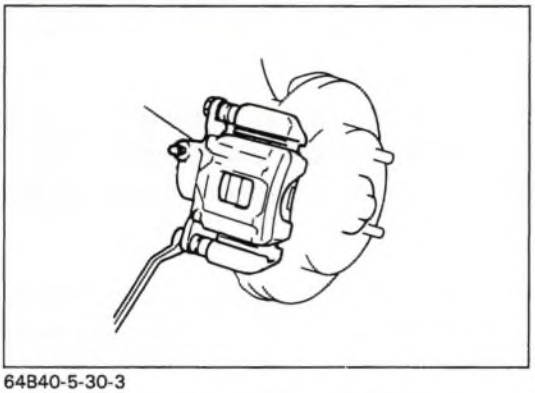
1. Caliper body
2. Piston
3. Seal
4. Pad
5. Anti noise shim
6. Carrier
7. Pin
8. Pad spring
9. Disc rotor
10. Screw
11. Dust cover
12. Bleeder plug



1. Caliper
2. Flexible hose
3. Hose mounting bolt

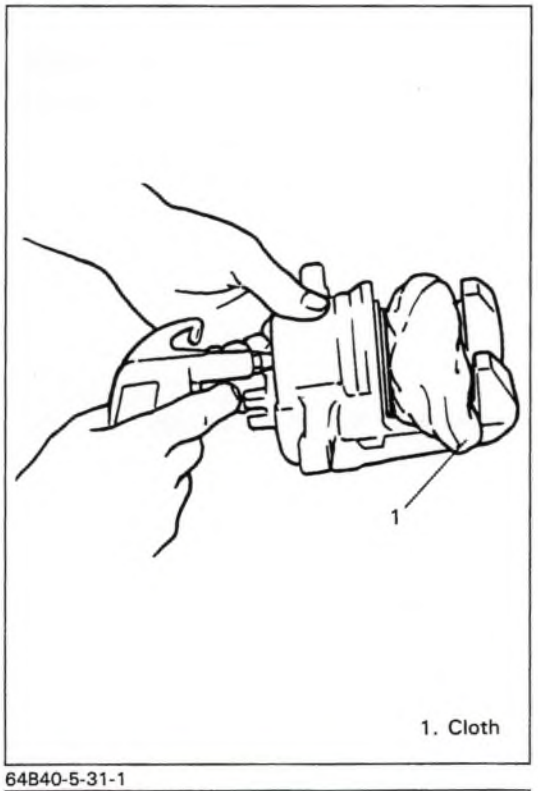
FRONT BRAKE CALIPER REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove brake flexible hose mounting bolt from caliper. As this will allow fluid to flow out of hose, have a container ready beforehand.



64B40-5-30-3

3) Remove caliper pin bolts.
4) Remove caliper from carrier.



1. Cloth

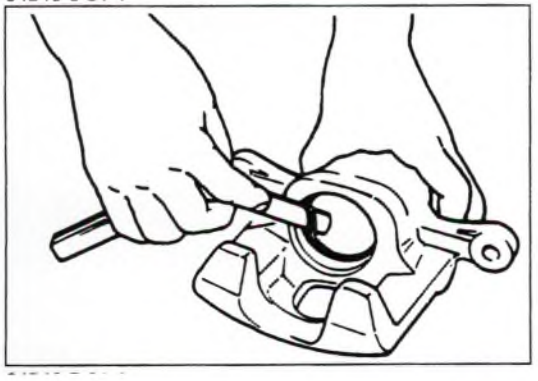
64B40-5-31-1

FRONT BRAKE CALIPER DISASSEMBLY

Before disassembly, clean all around caliper with brake fluid.

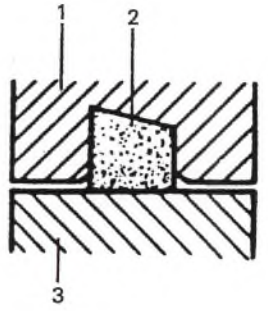
1) Blow compressed air into cylinder through bolt hole where flexible hose was fitted. With this air pressure, piston can be pushed out of cylinder.

WARNING:
Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.



2) Remove piston seal using a thin blade like a thickness gauge, etc.

NOTE:
Be careful not to damage inside (bore side) of cylinder.



1. Cylinder
2. Piston seal
3. Piston

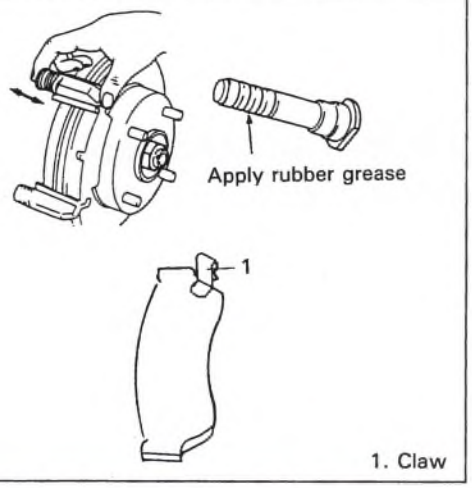
FRONT BRAKE CALIPER REASSEMBLY/ INSTALLATION

Reassemble front brake in reverse order of disassembly noting the following points.

CAUTION:
- **Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.**
- **Never use other fluid or thinner.**
- **Before installing piston and piston seal to cylinder, apply fluid to them.**
- **After reassembling brake lines, bleed air from them.**

Piston Seal

Piston seal is used to seal piston and cylinder and to adjust clearance between pad and disc. Replace with a new one at every overhaul. Fit piston seal into groove in cylinder taking care not to twist it.

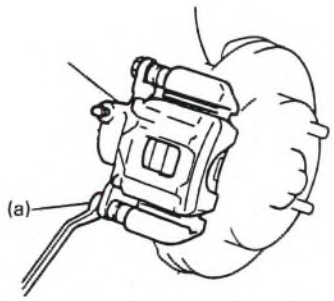


1. Claw

- Before installing caliper (cylinder body) to carrier, check to ensure that guide pin inserted in each caliper carrier hole can be moved smoothly in thrust direction.

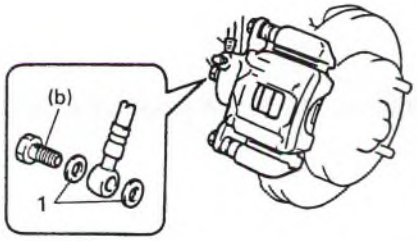
 NOTE:
 Where temperature gets as low as −30°C in cold weather, use rubber grease whose viscosity varies very little even at −40°C.

- Inner and outer brake pads are different.
 Inner pad has a claw.



- Tighten brake caliper bolts to specified torque.

 Tightening Torque
 (a): 22−32 N·m (2.2−3.2 kg-m)

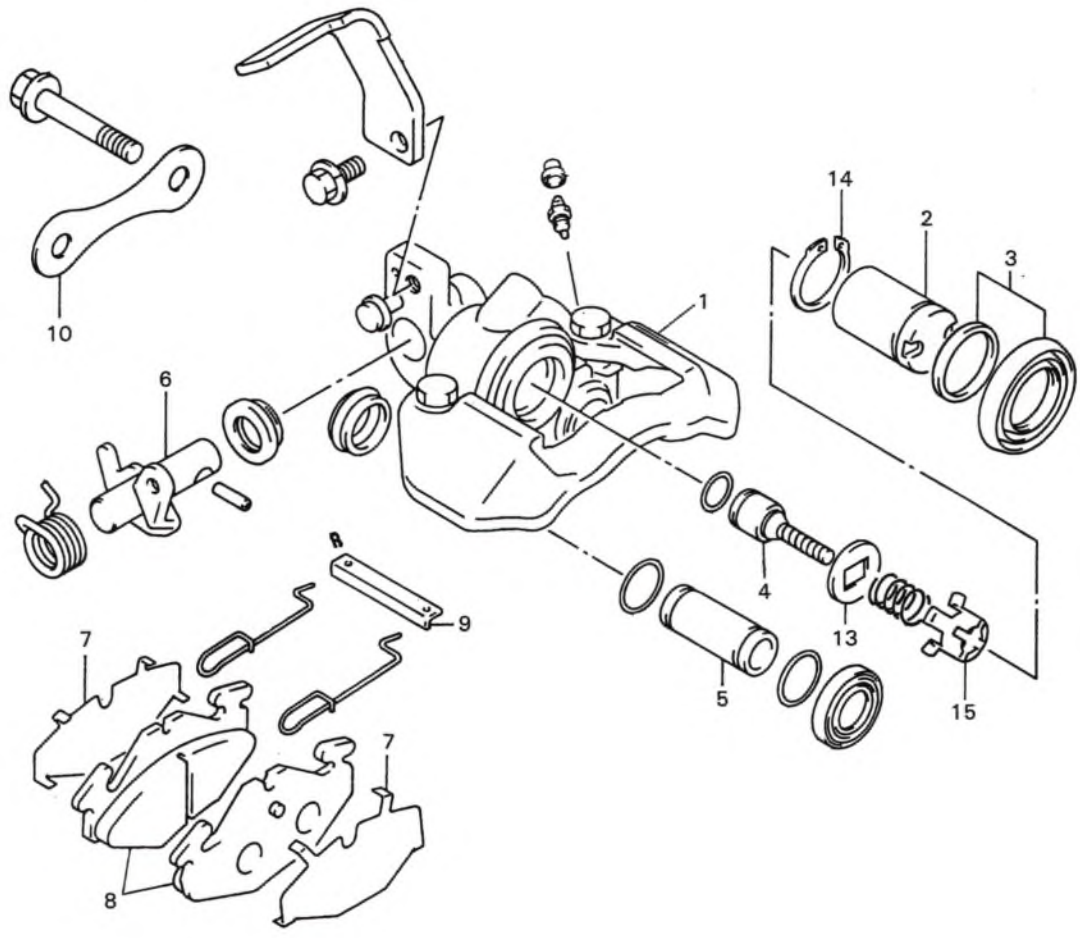


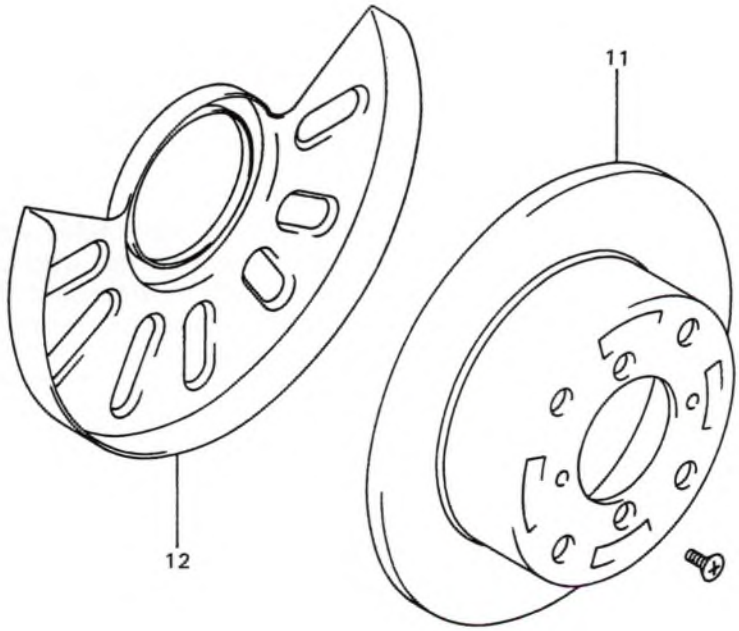
1. Hose washer

- Replace with new hose washer at every disconnection.
- Tighten brake hose bolt to specified torque.

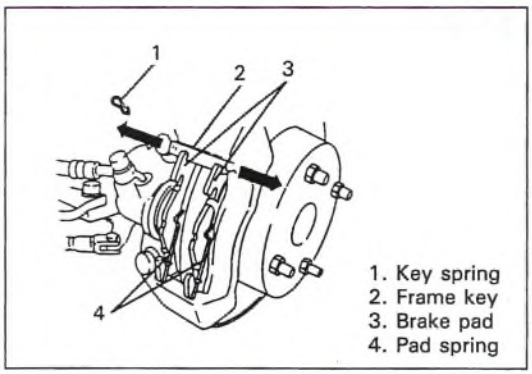
 Tightening Torque
 (b): 20−25 N·m (2.0−2.5 kg-m)

REAR DISC BRAKE R & I





1. Caliper body
2. Piston
3. Seal
4. Adjust bolt
5. Slide bush
6. Toggle shaft
7. Anti noise shim
8. Pad
9. Frame key
10. Anti rotation plate
11. Disc
12. Dust cover
13. Lock plate
14. Retainer

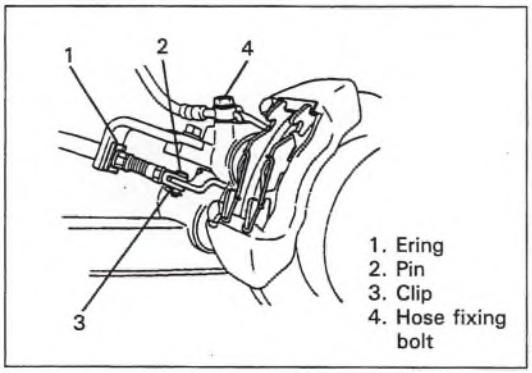


1. Key spring
2. Frame key
3. Brake pad
4. Pad spring

REMOVAL OF REAR BRAKE CALIPER AND DISC

1) Hoist vehicle and remove wheel.
2) Unhook pad springs from pads.
3) Remove key spring and remove frame key.
4) Remove brake pads.

NOTE:
Do not operate brake pedal with pads removed.



1. Ering
2. Pin
3. Clip
4. Hose fixing bolt

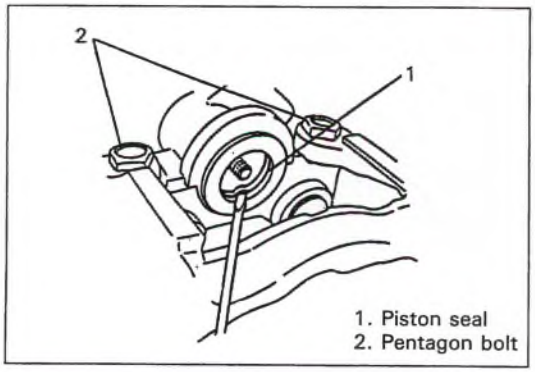
5) Remove parking brake cable E-ring and then remove parking brake cable.
6) Remove brake flexible hose mounting bolt from caliper. As this will allow fluid to flow out of hose, have a container ready beforehand.

7) Remove caliper assembly by removing caliper pin bolts.
8) Remove brake disc from wheel hub.

DISASSEMBLY OF REAR BRAKE CALIPER

Before disassembly, clean all around caliper with brake fluid.
1) Blow compressed air into cylinder through bolt hole where flexible hose was fitted. With this air pressure, piston can be pushed out of cylinder.

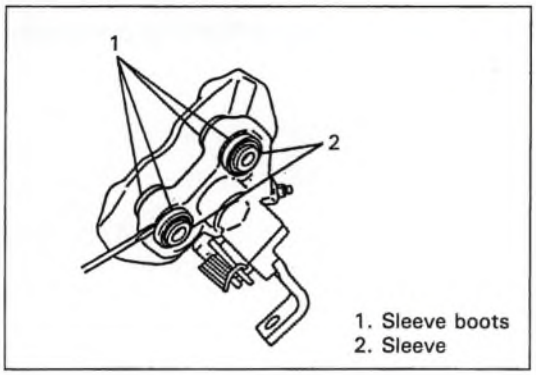
WARNING:
Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.



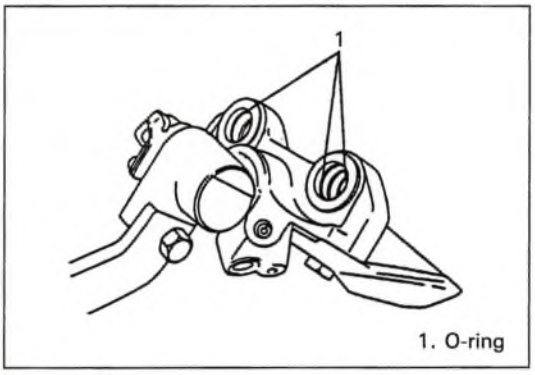
1. Piston seal
2. Pentagon bolt

2) Remove piston seal using a thin blade like a thickness gauge, etc.

NOTE:
- **Be careful not to damage inside (bore side) of cylinder.**
- **Never loosen pentagon bolt.**

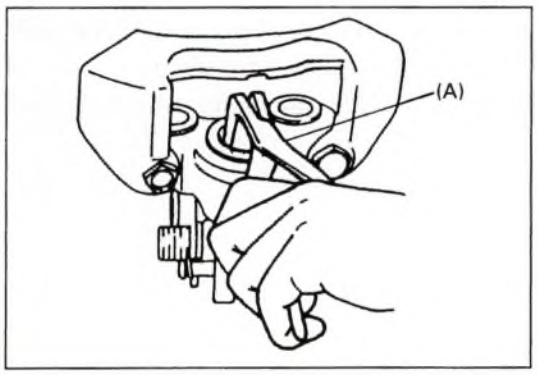


3) Remove sleeve boots (4 pcs.) and remove sleeves (2 pcs.).



4) Remove O-rings.

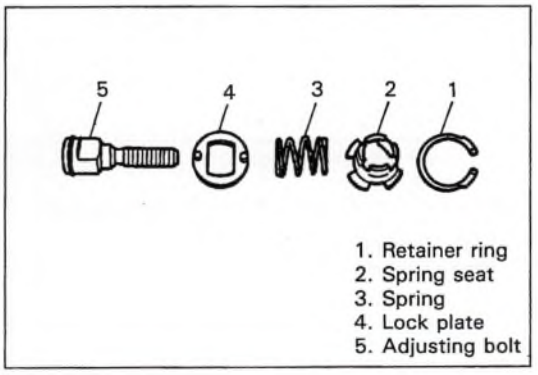
NOTE:
Be careful not to damage inside (bore side) of caliper.



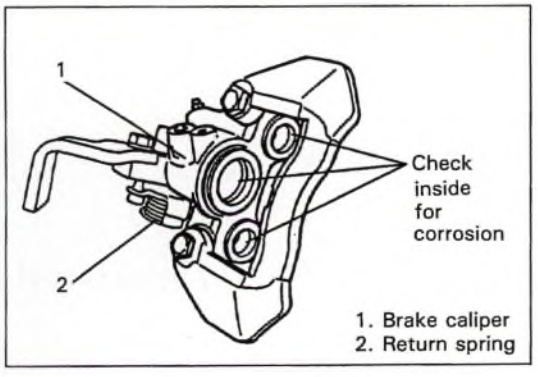
5) Remove retainer ring by using special tool.

Special Tool
(A): 09952-76010

NOTE:
Never loosen pentagon bolt.

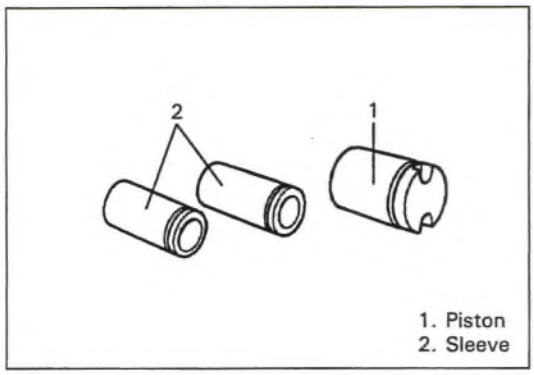


6) Remove spring seat, spring, lock plate and adjusting bolt.



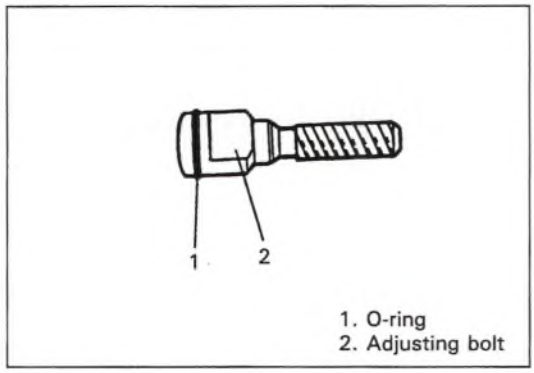
INSPECTION OF REAR BRAKE CALIPER

1) Inspect brake caliper for wear, cracks or deformation, and cylinder bore for corrosion or damage.
 If found defective, replace brake caliper assembly.
2) Inspect return spring for damage or weakening.



1. Piston
2. Sleeve

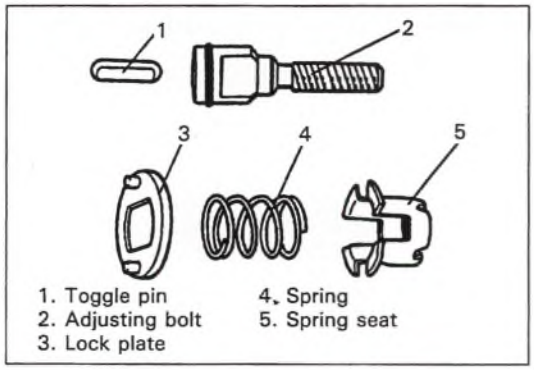
3) Inspect piston and sleeves for wear, damage or corrosion. If found defective, replace.



1. O-ring
2. Adjusting bolt

4) Inspect adjusting bolt (O-ring), lock plate, spring and spring seat for damage, cracks or deformation.

5) Install adjust bolt to adjusting block of piston. And check to make sure that adjust bolt turns smoothly.
If found defective, replace with new adjusting bolt and piston.

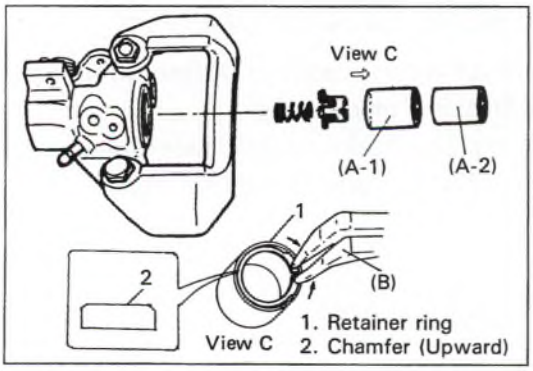


1. Toggle pin
2. Adjusting bolt
3. Lock plate
4. Spring
5. Spring seat

REASSEMBLY OF REAR BRAKE CALIPER

Reassemble rear brake caliper inner parts in reverse order of disassembly noting the following points.

CAUTION:
Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.

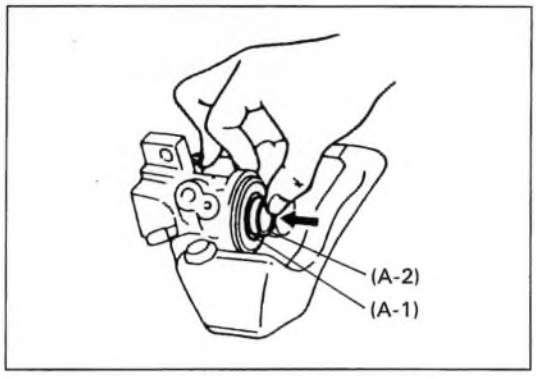


1. Retainer ring
2. Chamfer (Upward)

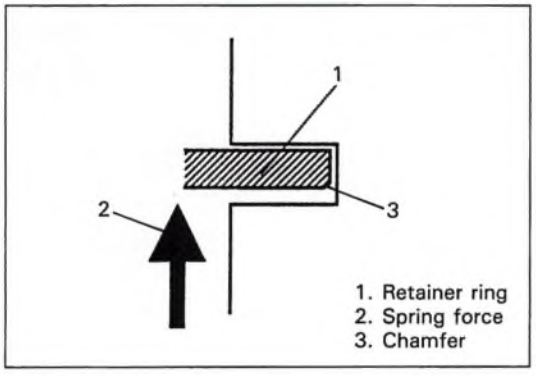
- Install retainer ring by using special tools.

Special Tool
(A—1): 09945-16070-001
(A—2): 09945-16070-002
(B) : 09952-76010

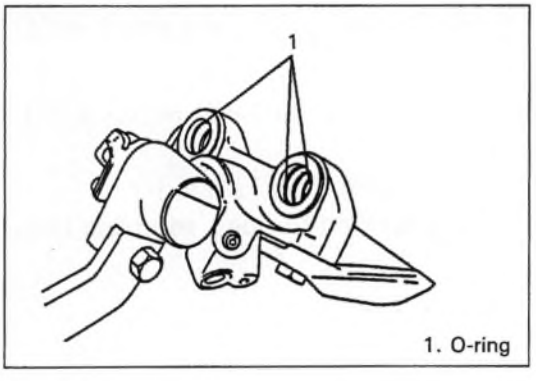
1) Install retainer ring to special tool (A—1) by using special tool (B).



2) Install special tool (A—1) to caliper body and then install special tool (A—1) to special tool (A—2).
3) Install retainer ring to ring groove by pushing special tool (A—2).
4) Check to make sure that retainer ring is into ring groove securely.

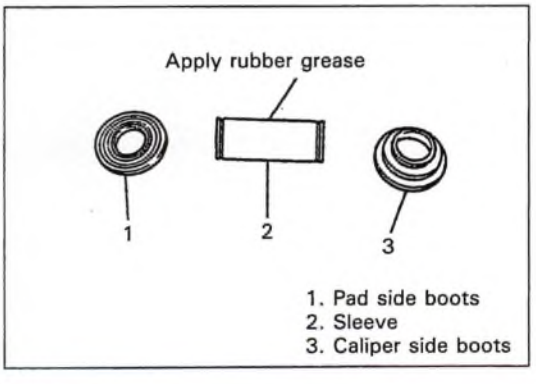


NOTE:
- **Retainer ring installed as shown in figure.**
- **Piston seal should not be installed yet.**

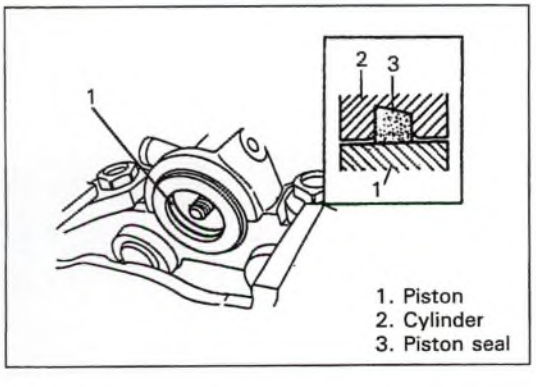


5) Install O-rings (4 pcs.).

NOTE:
Never reuse O-rings, replace them with new ones.

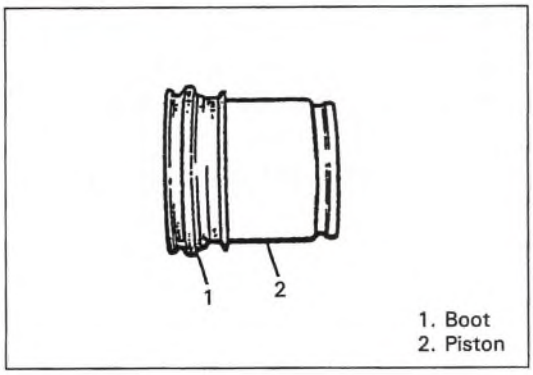


6) Before installation, apply rubber grease to sleeve. Install sleeve and boots and then check sleeve for smoothness.



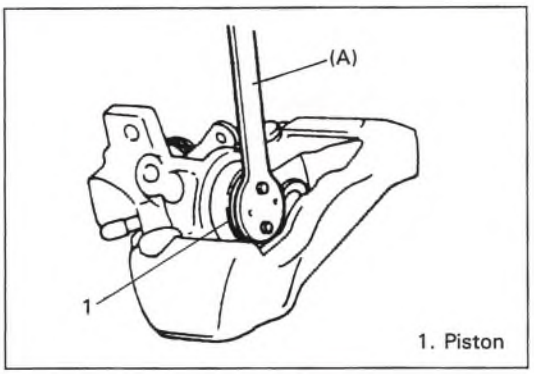
7) Install piston seal.

NOTE:
Fit piston seal into groove in cylinder taking care not to twist it.



1. Boot
2. Piston

8) Install boot to piston.
9) Fit boot into boot groove in cylinder with fingers.



1. Piston

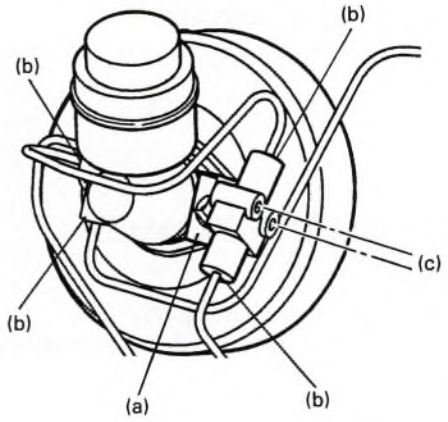
10) To install piston, push piston into screw part of push rod first and then turn piston clockwise by using special tool (Piston installer).

Special Tool
(A): 09945-16060

INSTALLATION OF REAR BRAKE CALIPER AND DISC

Reinstall rear brake caliper in reverse order of removal noting the following points.

- After installation, bleed air from brake system.
- Tighten bolts and nuts to specified torques, referring to p. 5-34.



(a): Master cylinder bolt
(b): Flare nut
(c): P-valve bolt

MASTER CYLINDER AND BRAKE BOOSTER REPAIR

REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

REMOVAL

1) Disconnect reservoir lead wire at coupler.
2) Clean around reservoir cap and take out fluid with syringe or such.
3) Depress brake pedal several times to facilitate removal.
4) Remove master cylinder by removing fixing bolts and flare nuts (brake pipe).

INSTALLATION

Install in reverse order of removal procedure noting following points.

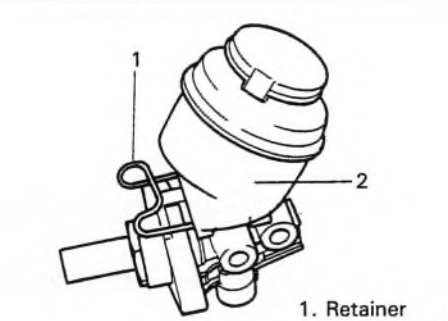
- After installation, bleed air from brake system.
- Tighten bolts and nuts to specified torques.

(a): 10—16 N·m (1.0—1.6 kg-m)
(b): 14—18 N·m (1.4—1.8 kg-m)
(c): 8—12 N·m (0.8—1.2 kg-m)

REMOVE AND INSTALL RESERVOIR TANK

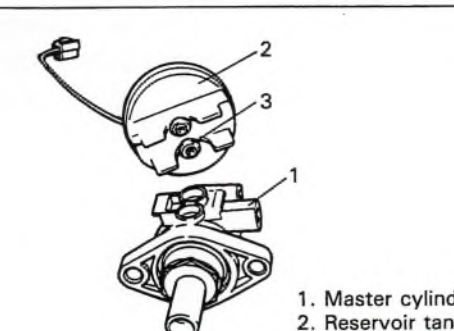
REMOVAL

1) Remove retainer as shown.



1. Retainer
2. Reservoir tank

2) Remove reservoir tank.

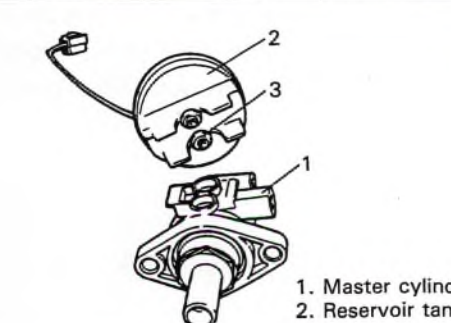


1. Master cylinder
2. Reservoir tank
3. O-ring

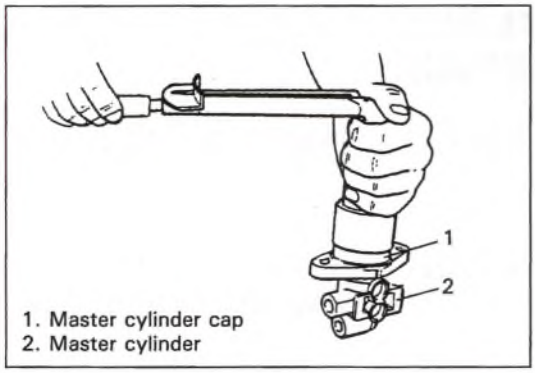
INSTALLATION

Install in reverse order of of removal procedure noting following points.

When using new O-rings, lubricate them with the same fluid as the one to fill reservoir with. Then install O-rings to reservoir. O-rings must be seated in place.



1. Master cylinder
2. Reservoir tank
3. O-ring

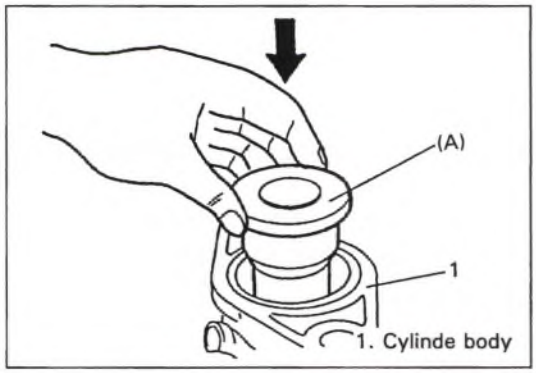


1. Master cylinder cap
2. Master cylinder

DISASSEMBLY OF MASTER CYLINDER

Remove master cylinder cap. Then remove pistons, springs, cups and seals.

NOTE:
Do not hold cylinder body directly with vice.



1. Cylinde body

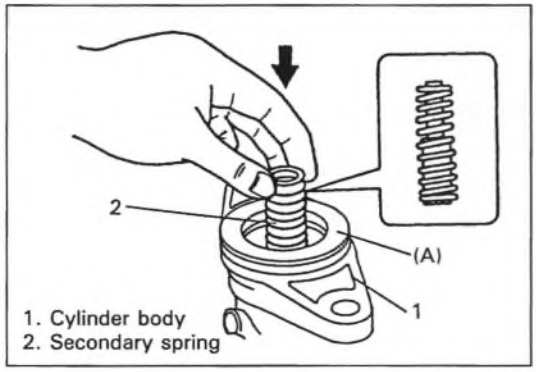
REASSEMBLY OF MASTER CYLINDER

NOTE:
- **See NOTE at the beginning of this section.**
- **Before assembling, wash each part in fluid recommended to use for that vehicle.**

1) Install special tool to cylinder body.

Special Tool
(A): 09951-18220

NOTE:
Do not hold cylinder body directly with vice.

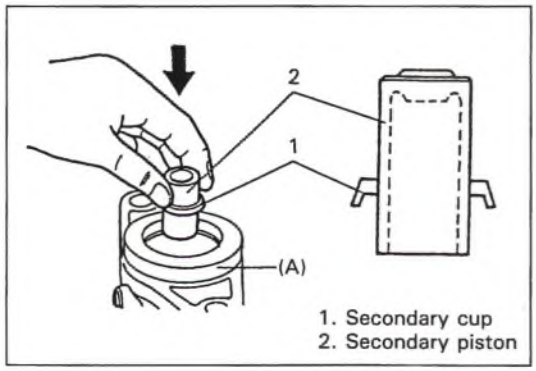


1. Cylinder body
2. Secondary spring

2) Install secondary return spring to cylinder body.

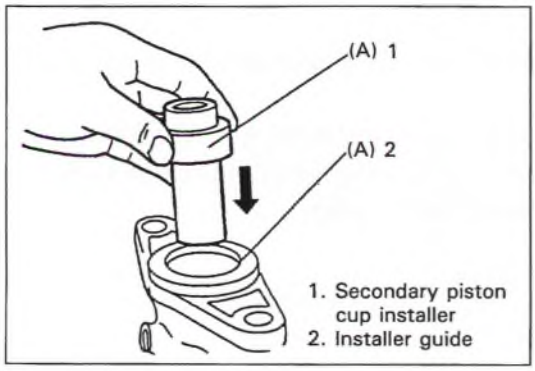
Special Tool
(A): 09951-18220

NOTE:
Make sure that secondary return spring is installed in correct direction.
Note that secondary return spring has less coils than primary return spring.



1. Secondary cup
2. Secondary piston

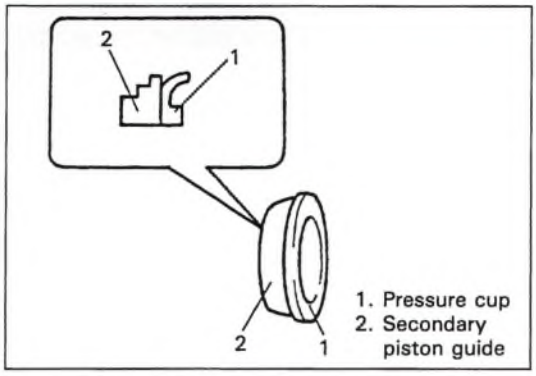
3) Install secondary cup to secondary piston as shown in figure. And then install secondary piston to cylinder body.



1. Secondary piston cup installer
2. Installer guide

4) By using special tool, push secondary piston cup into cylinder till tool (A)-1 contacts with tool (A)-2, so that piston cup is installed at original piston. And then remove special tools.

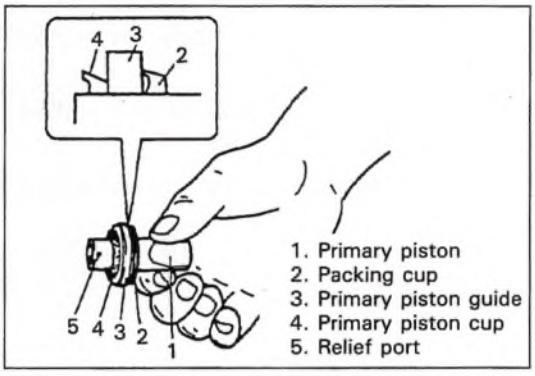
Specail Tool
(A): 09951-18220



5) Install pressure cup to secondary piston guide as shown in left figure.

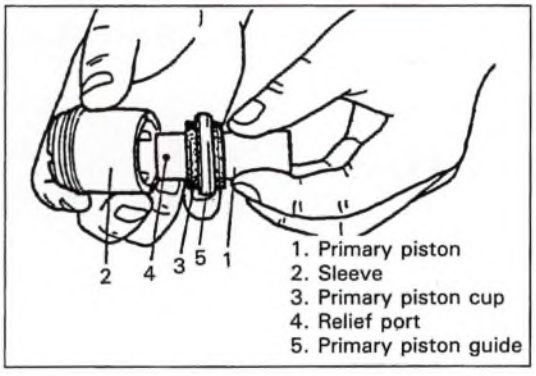
NOTE:
For this installation, fit 6 lugs on secondary piston guide with 6 dents in pressure cup securely.

6) Install what is assembled in Step 5) into cylinder body.



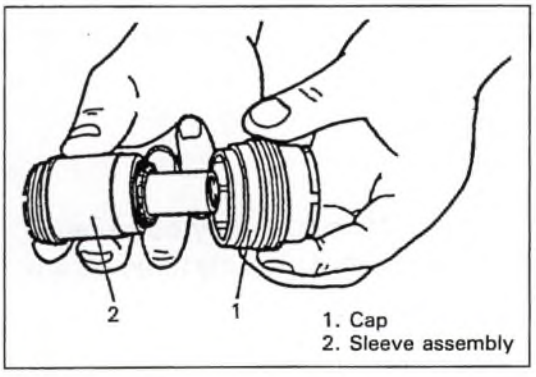
7) Install packing cup, primary piston guide and primary piston cup to primary piston as shown in figure at the left.

NOTE:
Check relief port for clogging.

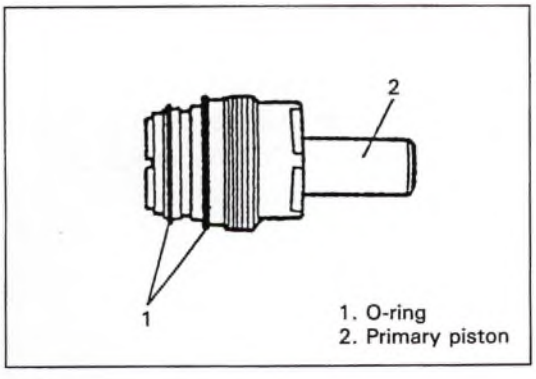


8) Install what is assembled in above Step 7) into sleeve.

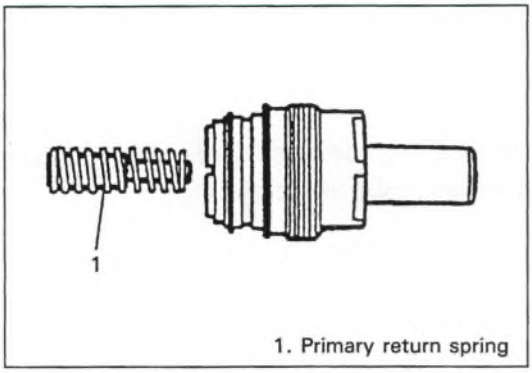
NOTE:
Push it in, holding primary piston guide and using care not to cause damage to lip of primary piston cup.



9) Install primary piston and sleeve assembly to cap.

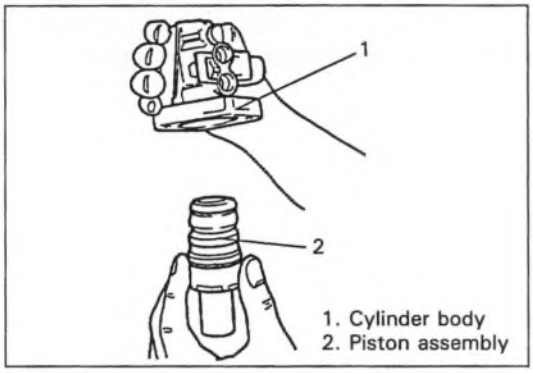


10) Install O-rings to sleeve and cap.



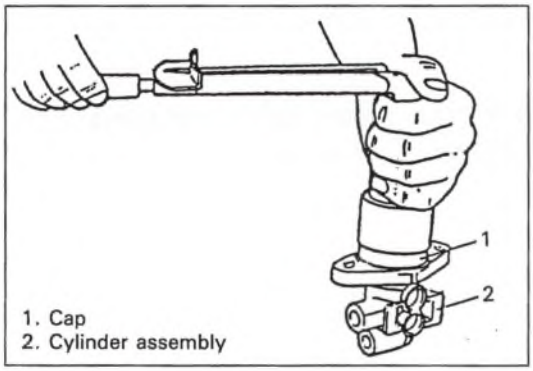
1. Primary return spring

11) Install primary return spring to primary piston assembly as shown in figure at the left.



1. Cylinder body
2. Piston assembly

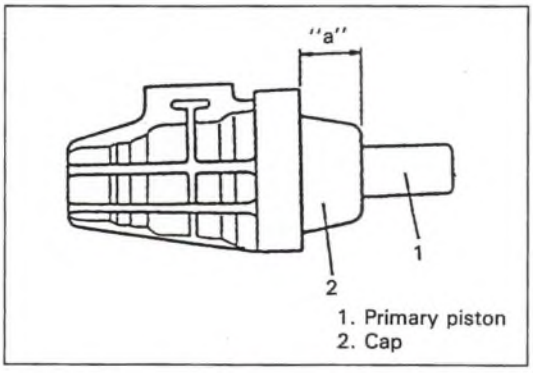
12) Install piston assembly into cylinder body from the bottom.
- Use care so that those parts which have been installed in Steps 1) through 6) will not fall off.
- Hold piston assembly by its cap and insert it smoothly in one try, or O-ring may come off.



1. Cap
2. Cylinder assembly

13) Tighten cap by hand and then tighten cap to specified torque.

Tightening Torque
(a): 10—14 N·m (1.0—1.4 kg-m)

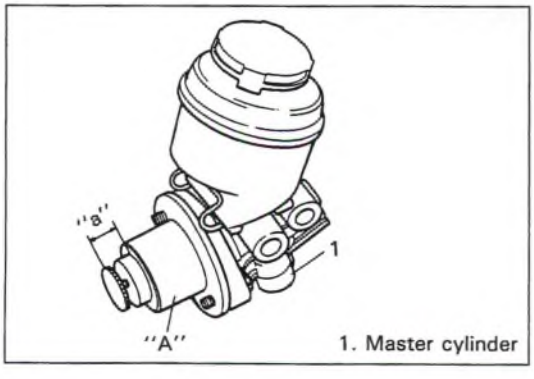


1. Primary piston
2. Cap

14) After tightening cap, check to make sure that length "a" is less than 16 mm.

Length "a": Less than 16 mm

NOTE:
If measured value exceeds 16 mm, it may be because pressure cup has not been installed properly (grooves are not fitted properly).



1. Master cylinder

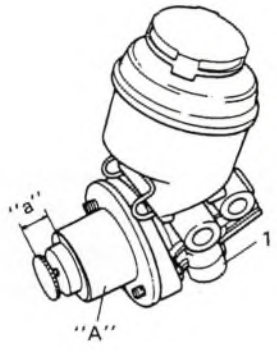
MASTER CYLINDER INSPECTION

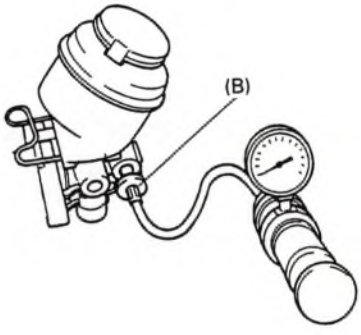
Perform following inspection after reassembly.

1) With special tool installed to master cylinder with 2 bolts as shown, adjust so that dimension "a" becomes 29.7 mm when adjusting bolt is tightened.

Special Tool
(A): 09952-56010

Dimension
"a": 29.7 mm





1. Master cylinder

2) With special tool installed to end or radiator cap tester, send air from cap tester and check that pressure does not rise. Then with special tool tightened by 5 mm more, check that pressure rises 0.5 kg/cm² or more.

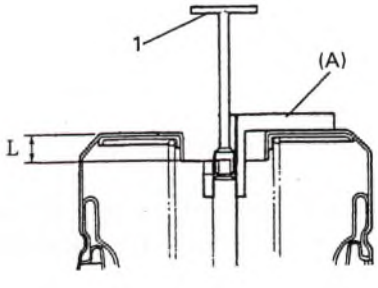
Special Tool
(B): 09952-46010

Dimension
"a": 24.7 mm

NOTE:
When checking front side, close hole on one side with special tool.

Dimension "a" (mm)	29.7	24.7
When air is supplied to front or rear port	No pressure rise should occur.	Higher than 0.5 kg/cm² pressure rise should occur.
Remarks	Check for continuity to ambient air chamber.	Check pressure chamber for air-tightness.

NOTE:
- **Compressor must not be used as compressor oil is mixed with air in it.**
- **Check for fluid leakage, pedal travel, pedal play, etc. after installing it to vehicle.**



1. Wrench
2. Booster push rod adjuster

LENGTH BETWEEN BOOSTER PISTON ROD AND BOOSTER FRONT SURFACE ADJUSTMENT

CAUTION:
- **When booster or master cylinder has been replaced, make sure to adjust distance between end of booster piston rod and front face of booster properly. Malajusted distance will cause brake to drag and pedal stroke to be too long, either of which will be dangerous.**
- **Don't make flaws to booster seal.**
- **Don't drop dust and so on into booster.**

1) Remove push rod seal and push rod retainer.
2) Adjust distance "L" by turning adjusting screw of piston rod.

Distance
"L": 29.2±0.1 mm

Special Tool
(A): 09952-16020

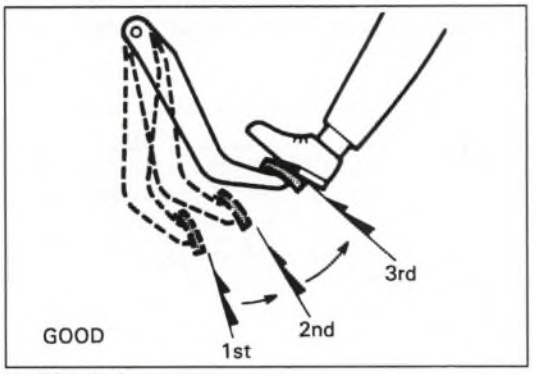
INSPECT BOOSTER OPERATION

NOTE:
For this check, make sure that no air is in hydraulic line.

INSPECTION WITHOUT TESTER

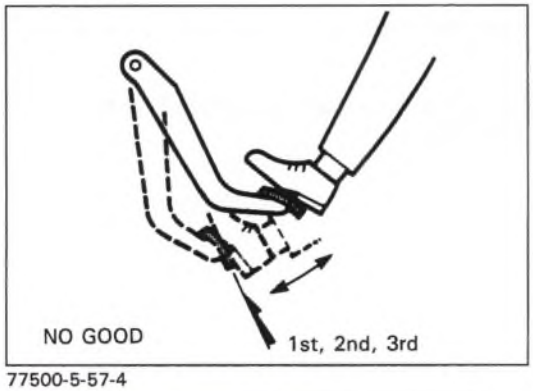
Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.



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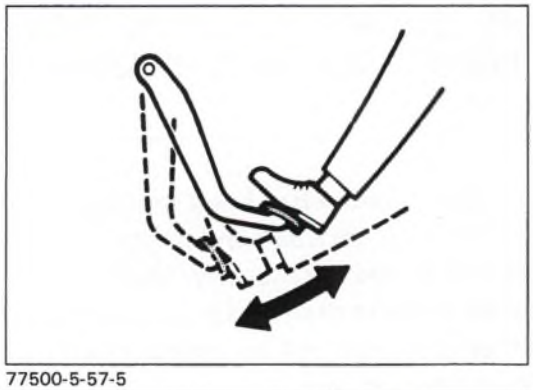
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.



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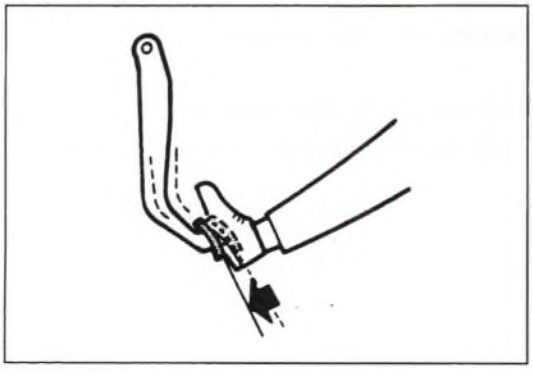
4) If pedal travel doesn't change, air tightness isn't obtained.

NOTE:
If defective, inspect vacuum lines and sealing parts, and replace any faulty part.
When this has been done, repeat the entire test.

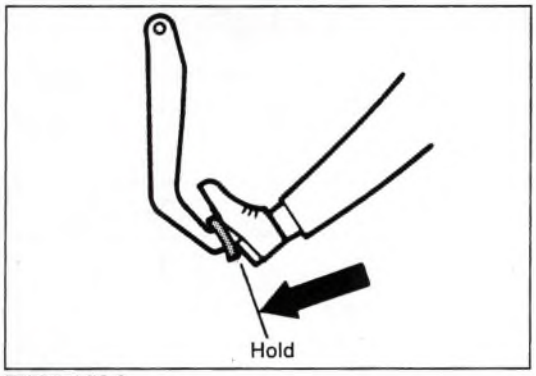

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Check Operation

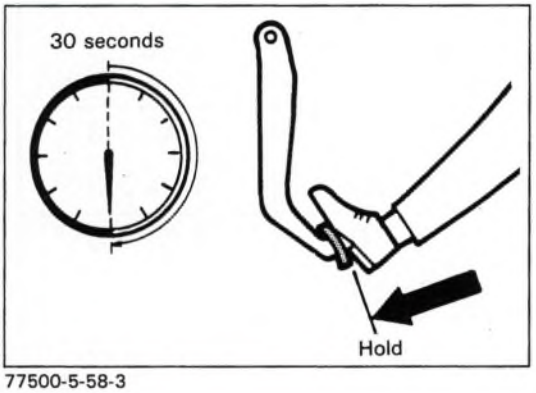
1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.



2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.



77500-5-58-2



77500-5-58-3

Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts		Tightening torque	
		N·m	kg-m
Brake caliper bolt (Front)		70—100	7.0—10.0
Flexible hose bolt (Front & rear brake)		20—25	2.0—2.5
Brake caliper bolt (Rear)		100—130	10.0—13.0
Master cylinder nut or booster nut		10—16	1.0—1.6
Brake joint bolt		8—12	0.8—1.2
Proportioning valve bolt			
Brake pipe flare nut		14—18	1.4—1.8
Brake pedal shaft nut		18—28	1.8—2.8
Brake bleeder plug	(Front caliper)	7—10	0.7—1.0
	(Rear caliper)	6—10	0.6—1.0
Wheel nut		50—80	5.0—8.0

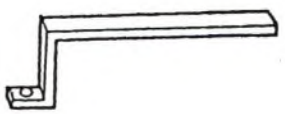
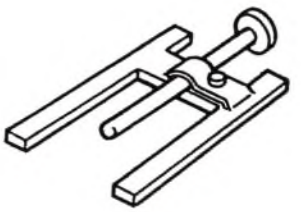
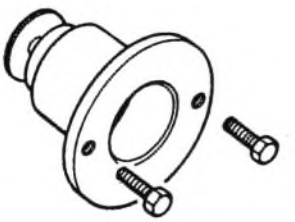
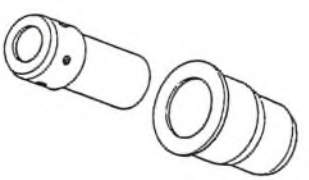
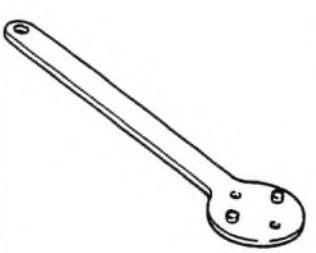
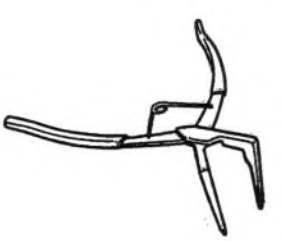
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REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	Indicated on reservoir tank cap or described in owner's manual of vehicle	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder and brake caliper (front and rear) when they are disassembled.
Rubber grease	Furnished in repair kit	• To apply to rear brake caliper inner parts where to applicate is instructed in this manual.

64B40-5-67-2

SPECIAL TOOLS

 09952-16020 Booster push rod adjuster	 09950-96010 Piston rod gauge	 09952-56010 Primary piston holder	 09952-26020 Master cylinder plug
 09952-46010 Master cylinder attachment	 09951-18220 Secondary cup installer set	 09943-17911 Brake drum remover	 09942-15510 Sliding hummer
 No.1 09951-16020  No.2 09951-18210 Booster NO.2 body oil seal remover and installer No.1, No.2	 09945-16060 Piston installer handle	 09945-16070 Retainer ring installer set	 09952-76010 Snap ring pliers

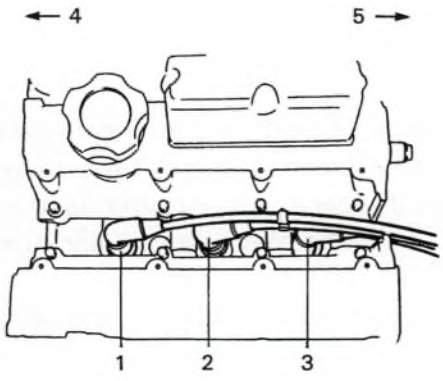
SECTION 6

ENGINE

CONTENTS

GENERAL INFORMATION 6-1
ENGINE DIAGNOSIS 6-5

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1. No.1 cylinder
2. No.2 cylinder
3. No.3 cylinder
4. Crankshaft pulley side
5. Flywheel side

GENERAL INFORMATION

STATEMENT ON CLEANLINESS AND CARE

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an milimeter (ten thousands of an inch).

Accordingly, when any internal engine parts are serviced, care and cleanliness are important.

Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

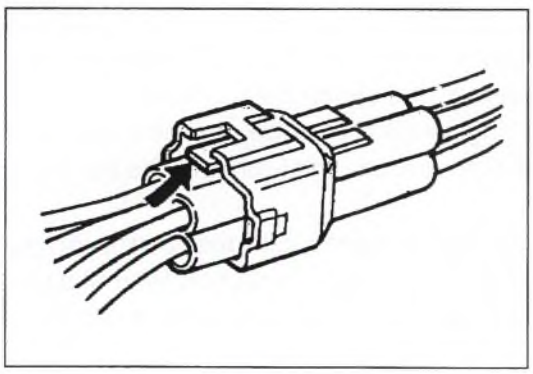
- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
 At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine.
 Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- Throughout this manual, the three cylinders of the engine are identified by numbers; No.1 No.2 and No.3 counted front crankshaft pulley side to flywheel side.

GENERAL INFORMATION ON ENGINE SERVICE

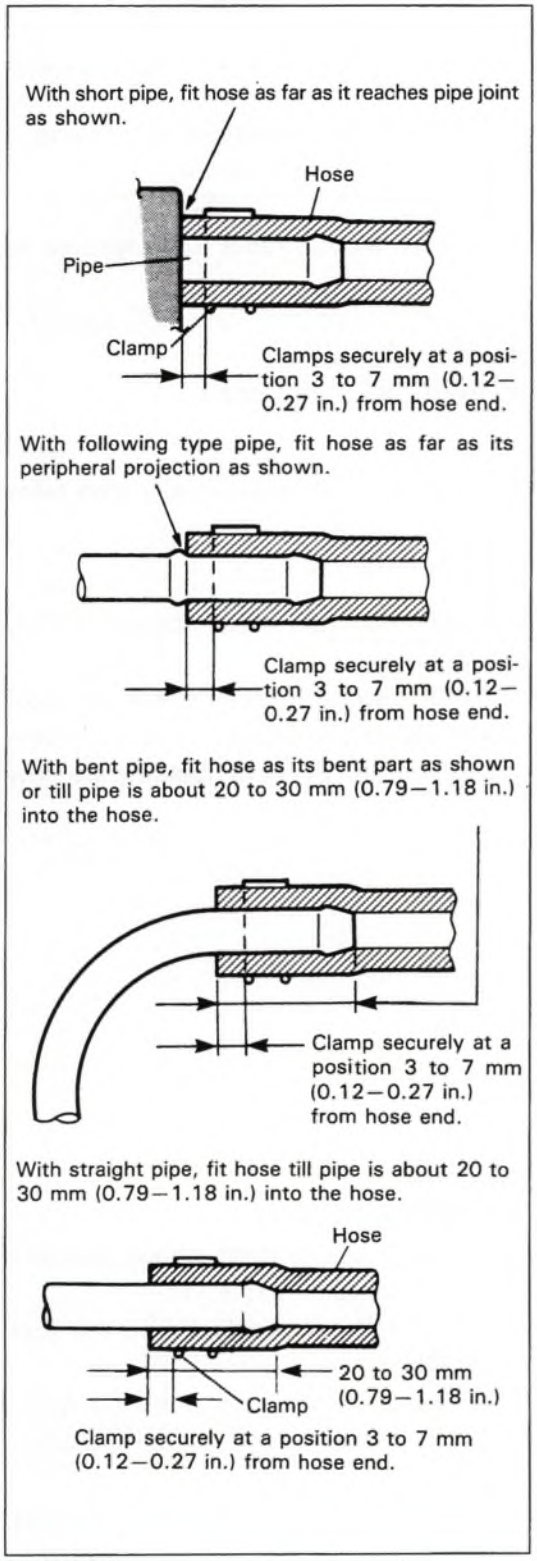
THE FOLLOWING INFORMATION ON ENGINE SERVICE SHOULD BE NOTED CAREFULLY, AS IT IS IMPORTANT IN PREVENTING DAMAGE, AND IN CONTRIBUTING TO RELIABLE ENGINE PERFORMANCE.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearace between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits.
 When performing any work where electrical terminals could possible be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.

64B40-6-2-1



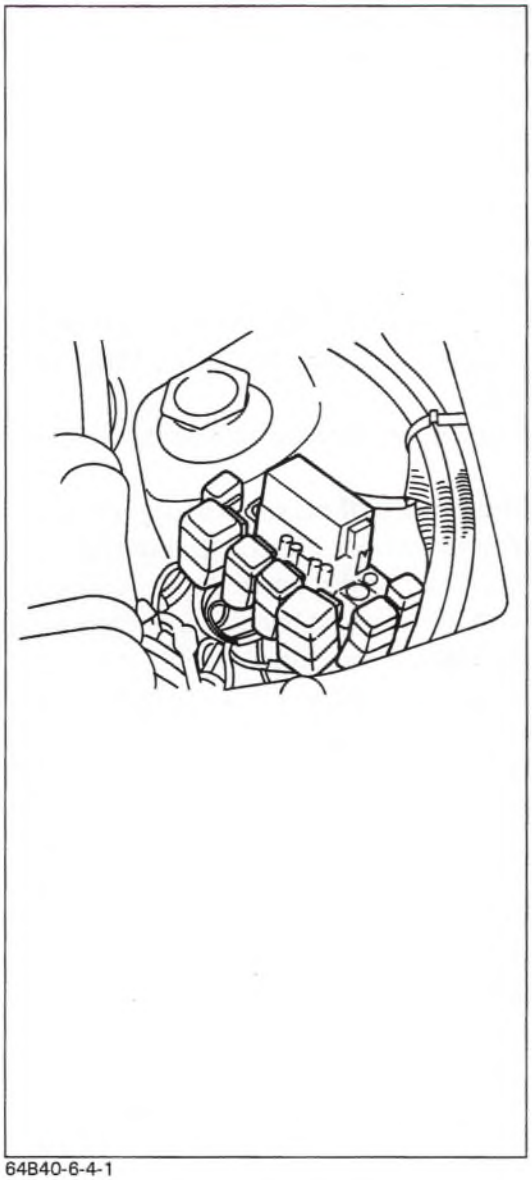
- When disconnecting couplers, don't pull wire harness but make sure to hold coupler itself. With lock type coupler, be sure to unlock before disconnection. Attempt to disconnect coupler without unlocking may result in damage to coupler.
 When connecting lock type coupler, insert it till clicking sound is heard and connect it securely.



64B40-6-3-1

PRECAUTION ON FUEL SYSTEM SERVICE

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- As fuel feed line (between fuel pump and fuel pressure regulator) is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected.
 Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to "FUEL PRESSURE RELIEF PROCEDURE".
 A small amount of fuel may be released after the fuel line is disconnected.
 In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.
- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.
- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to left figure Hose Connection.
 After connecting, make sure that it has no twist or kink.
- When installing fuel filter union bolt or plug bolt on union bolt, always use new gasket and tighten it to specified torque. See Section 6C for specified torque.
- When installing injector, fuel feed pipe or fuel presure regulator, lubricate its O ring with spindle oil or gasoline.
- When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque.



64B40-6-4-1

FUEL PRESSURE RELIEF PROCEDURE

CAUTION:
This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

After making sure that engine is cold, relief fuel pressure as follows.

1) Place transmission gear shift lever in "Neutral", set parking brake, and block drive wheels.
2) Disconnect coupler from fuel pump relay.

NOTE:
Make sure of wire colors to distinguish fuel pump relay from other relays.
Wire color: P, B/R, Br/B, B/W

3) Remove fuel filler cap to release fuel vapor pressure in fuel tank and then reinstall it.
4) Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2—3 times for about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
5) Upon completion of servicing, connect coupler to fuel pump relay.

FUEL LEAKAGE CHECK PROCEDURE

After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1. Turn ON ignition switch for 5 seconds (to operate fuel pump) and then turn it OFF.
 Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line (till fuel pressure is felt by hand placed on fuel return hose.)
2. In this state, check to see that there are no fuel leakages from any part of fuel system.

64B40-6-4-4

ENGINE DIAGNOSIS

Condition	Possible Cause	Correction
Hard Starting (Engine cranks OK)	**Ignition system out of order**	
	• Blown fuse	Repair or replace
	• Faulty spark plug	Clean and adjust plug gap or replace
	• Leaky high-tension cord	Replace
	• Loose connection or disconnection of high-tension cords or lead wires	Repair or replace
	• Maladjusted signal rotor air gap	Adjust
	• Faulty camshaft position sensor (signal generator) in distributor	Replace
	• Improper ignition timing	Adjust
	• Faulty ignition coil	Replace
	• Cracked rotor or cap in distributor	Replace
	Fuel system out of order	
	• Lack of fuel in fuel tank	Refill
	• Dirty fuel filter	Replace
	• Dirty or clogged fuel hose or pipe	Clean
	• Malfunctioning fuel pump	Replace
	Air intake system out of order	
	• Vacuum leaks from air intake system	Repair or replace
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Low compression	
	• Poor spark plug tightening or faulty gasket	Tighten to specified torque or replace gasket
	• Compression leak from valve seat	Remove cylinder head and lap valves
	• Sticky valve stem	Correct or replace valve and valve guide
	• Weak or damaged valve springs	Replace
	• Compression leak at cylinder head gasket	Repair or replace
	• Sticking or damaged piston ring	Replace
	• Worn piston, ring or cylinder	Replace ring and piston. Rebore or replace cylinder
	Others	
	• Broken valve timing belt	Replace

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Condition	Possible Cause	Correction
Engine has no power	**Ignition system out of order**	
	• Improper ignition timing	Adjust and check ignition timing advance referring to SECTION 6F
	• Faulty spark plug	Adjust or replace
	• Worn distributor terminals	Dress or replace Also check rotor
	• Leaks, loose connection or disconnection of high-tension cord	Connect or replace as necessary
	Engine overheating	Refer to "Overheating" section
	Fuel system out of order	
	• Clogged fuel hose or pipe	Clean
	• Dirty or clogged fuel filter	Replace
	Air intake system out of order	
	• Clogged air cleaner element	Clean or repalce
	• Vacuum leaks from air intake system	Repair or replace
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Low compression	Previously outlined
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or replace
Improper engine idling or engine fails to idle	**Ignition system out of order**	
	• Faulty spark plug	Adjust or replace
	• Leaky or disconnected high-tension cord	Connect or replace
	• Worn distributor terminals	Replace
	• Cracked cap in distributor with leakage inside	Replace
	• Improper ignition timing	Adjust and check ignition timing advance referring to SECTION 6F

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Condition	Possible Cause	Correction
	Fuel system out of order	
	• Shortage of fuel in fuel tank	Refill
	Air intake system out of order	
	• Clogged air cleaner element	Clean or replace
	• Vacuum leaks from air intake system	Repair or replace
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary
Engine hesitates (Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop sign.)	**Ignition system out of order**	
	• Improper ignition timing	Adjust
	• Spark plug faulty or plug gap out of adjustment	Replace or adjust gap
	• Leaky high tension cord	Replace
	Fuel system out of order	
	• Clogged fuel filter, hose or pipe	Clean or replace
	Air intake system out of order	
	• Clogged air cleaner element	Clean or replace
	• Vacuum leaks from air intake system	Repair or replace
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary

64B40-6-7-1

Condition	Possible Cause	Correction
Surge (Engine power variation under steady throttle or cruise. Feels like vehicle speeds up and down with no change in accelerator pedal.)	**Ignition system out of order**	
	• Leaky or loosely connected high-tension cord	Check and repair or replace
	• Faulty spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.)	Check and clean, adjust or replace
	• Cracked rotor or cap in distributor	Replace
	• Improper ignition timing	Adjust and check ignition timing advance referring to SECTION 6F
	Fuel system out of order	
	• Clogged fuel filter	Replace
	• Kinky or damaged fuel hose and lines	Check and replace as necessary
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Others	
	• Malfunctioning EGR valve	Check and replace as necessay
Excessive detonation (Engine makes sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)	**Engine overheating**	Refer to "Overheating" section
	Ignition system out of order	
	• Faulty spark plug	Replace
	• Loose connection of high-tension cord	Connect securely
	• Improper ignition timing	Adjust and check ignition timing advance referring to SECTION 6F
	Fuel system out of order	
	• Clogged fuel filter or fuel lines	Replace or clean
	Air intake system out of order	
	• Vacuum leaks from air intake system	Repair or replace
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Others	
	• Excessive combustion chamber deposits	Remove carbon
	• Malfunctioning EGR valve	Check and replace as necessary

Condition	Possible Cause	Correction
Overheating	• Insufficient coolant	Replenish
	• Inoperative thermostat	Replace
	• Poor water pump performance	Replace
	• Improper ignition timing	Adjust and check ignition timing advance referring to SECTION 6F
	• Clogged or leaky radiator	Flush, repair or replace
	• Improper engine oil grade	Replace with proper grade oil
	• Clogged oil filter or oil strainer	Replace or clean (oil strainer)
	• Not enough oil	Replenish
	• Poor oil pump performance	Repair or replace
	• Oil leakage	Repair
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or repair
	• Blown cylinder head gasket	Replace
Poor gasoline mileage	**Fuel system out of order**	
	• Fuel leakage from fuel tank and lines	Repair or replace
	Air intake system out of order	
	• Clogged air cleaner element	Clean or replace
	Ignition system out of order	
	• Improper ignition timing	Adjust and check ignition timing advance referring to SECTION 6F
	• Leaks or loose connection of high-tension cord	Repair or replace
	• Faulty spark plug (improper gap, heavy deposits, and burned electrodes, etc..)	Clean, adjust or replace
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Low compression	Previously outlined
	Others	
	• Poor valve seating	Repair or replace
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or replace
	• Thermostat out of order	Replace
	• Improper tire pressure	Adjust
	• Malfunctioning EGR valve	Check and replace as necessary

64B40-6-9-1

Condition	Possible Cause	Correction
Excessive engine oil consumption	**Oil leakage**	
	• Loose oil drain plug	Tighten
	• Loose oil pan bolts	Tighten
	• Deteriorated or broken oil pan sealant	Replace sealant
	• Leaky crankshaft oil seals	Replace
	• Leaky cylinder head cover gasket	Replace
	• Improper tightening of oil filter	Tighten
	• Loose oil pressure switch	Tighten
	• Blown cylinder head gasket	Replace
	• Leaky camshaft oil seals	Replace
	Oil entering combustion chamber	
	• Sticky piston ring	Remove carbon and replace rings
	• Worn piston and cylinder	Replace or rebore cylinder, and replace piston
	• Worn piston ring groove and ring	Replace piston and ring
	• Improper location of piston ring gap	Reposition ring gap
	• Worn or damaged valve stem seal	Replace
	• Worn valve stem	Replace
Low oil pressure	• Not enough oil	Replenish
	• Improper oil viscosity	Use oil of proper viscosity
	• Malfunctioning oil pressure switch	Replace
	• Clogged oil strainer	Clean
	• Functional deterioration of oil pump	Replace
	• Worn oil pump relief valve	Replace
	• Excessive clearance in various sliding parts	Replace worn parts
Engine noise Note: Before checking mechanical noise, make sure that: • Ignition timing is properly adjusted. • Specified spark plug is used. • Specified fuel is used.	**Valve noise**	
	• Faulty hydraulic valve lash adjuster	Replace
	• Worn valve stem and guide	Replace
	• Weak or broken valve spring	Replace
	• Warped or bent valve	Replace
	• Loose camshaft housing bolts	Tighten to specification
	Piston, ring and cylinder noise	
	• Worn piston, ring and cyliner bore	Rebore or replace cylinder Replace piston and ring

60B40-6-10-1

Condition	Possible Cause	Correction
	Connecting rod noise	
	• Worn rod bearing	Replace
	• Worn crank pin	Repair by grinding or replace crankshaft
	• Loose connecting rod nuts	Tighten to specification
	• Low oil pressure	Previously outlined
	Crankshaft noise	
	• Low oil pressure	Previously outlined
	• Worn bearing	Replace
	• Worn crankshaft journal	Repair by grinding, or replace crankshaft
	• Loose bearing cap bolts	Tighten to specification
	• Excessive crankshaft thrust play	Replace thrust bearing

64B40-6-11-1

6A

SECTION 6A

ENGINE MECHANICAL

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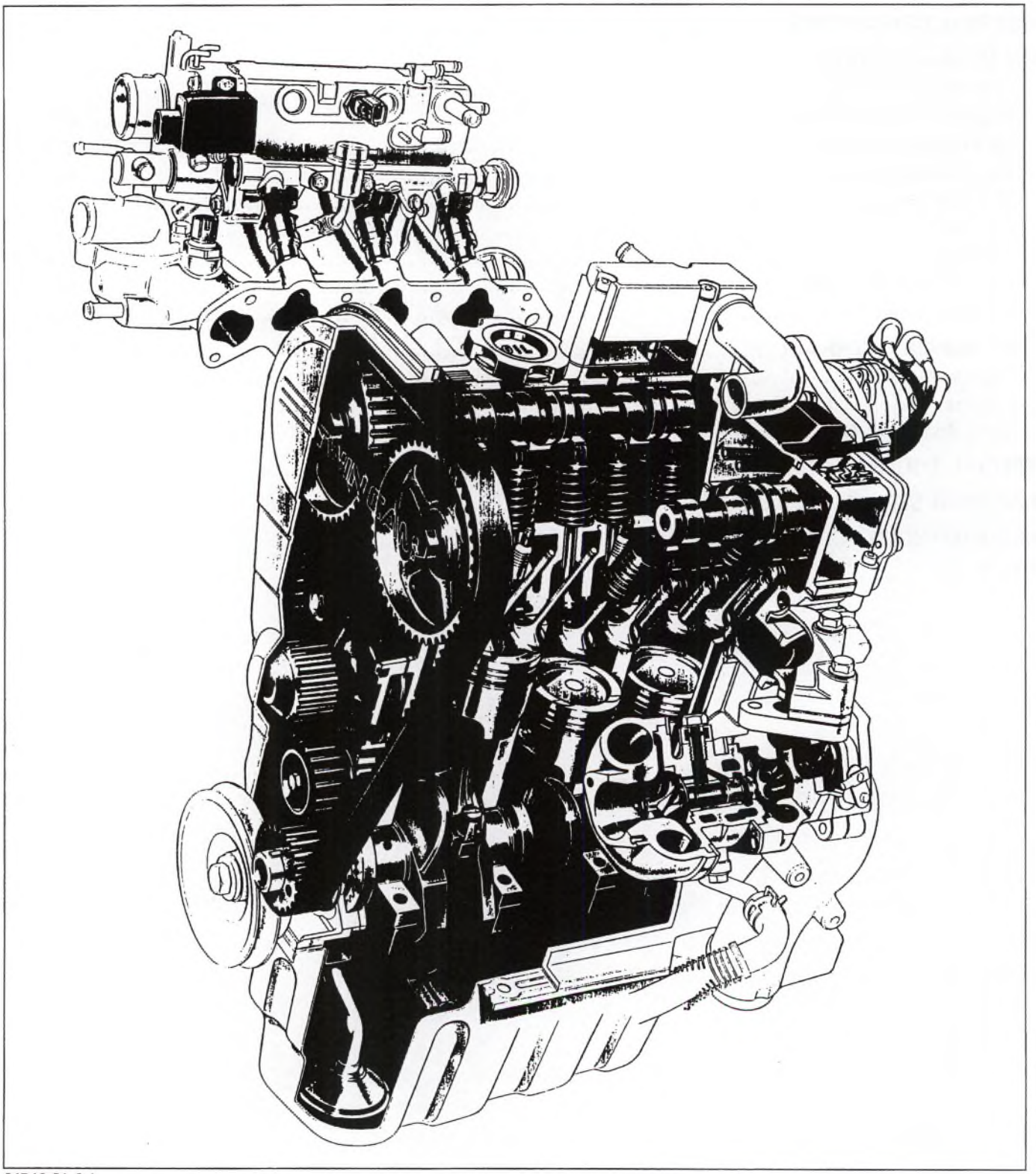
RECOMMENDED TORQUE SPECIFICATIONS 6A-52

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GENERAL DESCRIPTION

ENGINE

The engine is a water-cooled, in-line 3 cylinders, 4 stroke cycle gasoline unit with its D.O.H.C. (Double Overhead Camshaft) valve mechanism arranged for ''V''-type valve configuration.
Two camshafts (intake and exhaust sides), mounted over the cylinder head, are driven by crankshaft by way of the timing belt and each of them opens and closes its valve via the hydraulic valve lash adjuster.
As two intake valves and two exhaust valves are installed to the cylinder head of each cylinder, there are 12 valves in all.

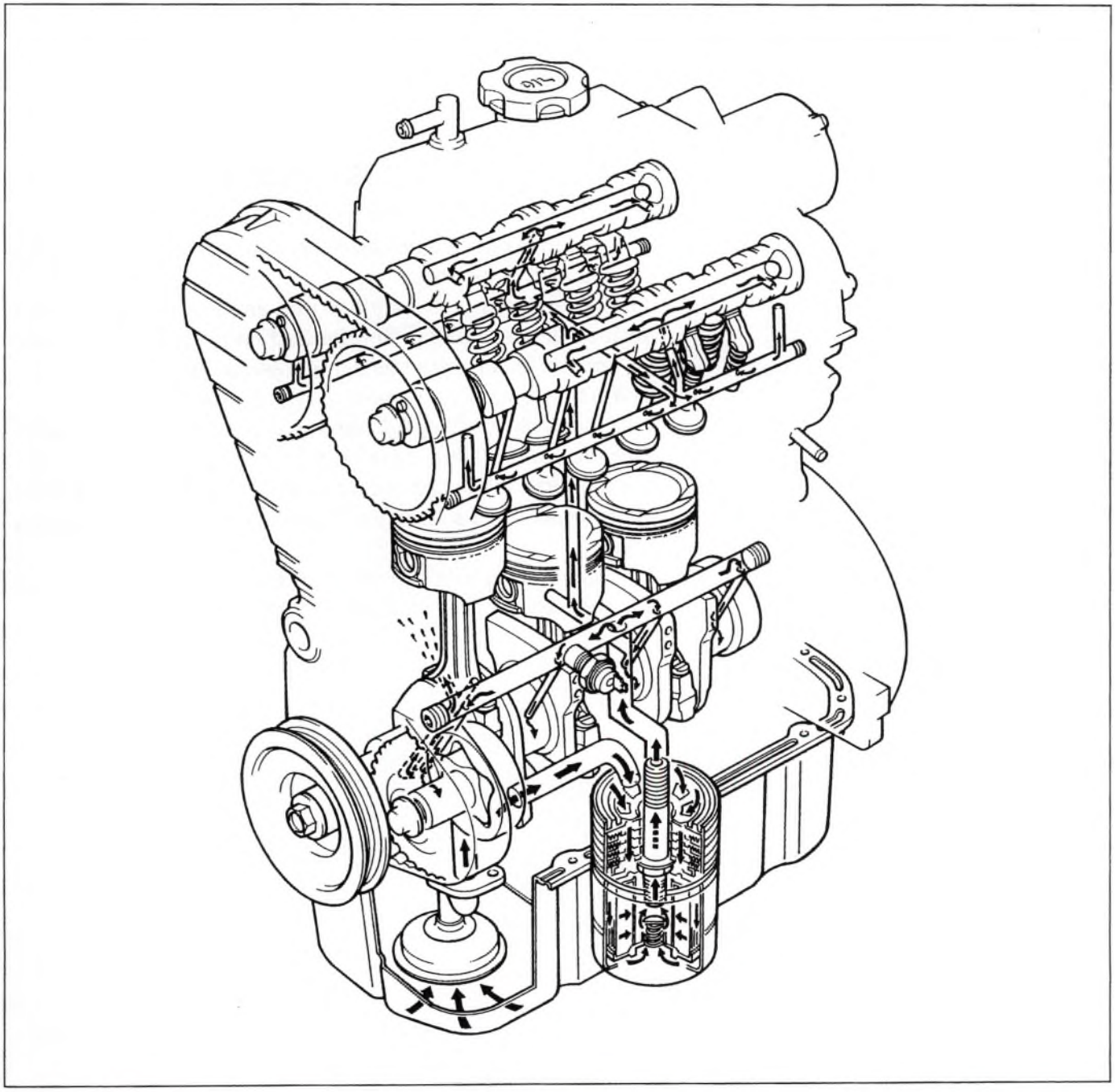


ENGINE LUBRICATION

The oil pump is of a trochoid type, and mounted on crankshaft at crankshaft pulley side.
Oil is drawn up through oil pump strainer and passed through pump to oil filter.
The filtered oil flows into two paths in cylinder block.
In one path, oil reaches crankshaft journal bearings.
Oil from crankshaft journal bearings is supplied to connecting rod bearings by means of intersecting passages drilled in crankshaft, and then injected from a small hole provided on big end of connecting rod to lubricate piston, rings, and cylinder wall.

In another path, oil goes up to cylinder head and lubricates camshaft journals and hydraulic valve lash adjusters, etc., passing through oil gallery in cylinder head wall.

An oil relief valve is provided on oil pump. This valve starts relieving oil pressure when the pressure grows over about 340 kPa (3.4 kg/cm^2). Relieved oil drains back to oil pan.



CYLINDER BLOCK

The cylinder block is made of cast iron and has 3 cylinders arranged "In-Line". The block is shaped to present deep skirts and retain greater rigidity.

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CRANKSHAFT AND MAIN BEARINGS

A monoblock crankshaft made of forged steel is supported by 4 main bearings which are of precision insert type. Three crank pins on the crankshaft are positioned 120° apart.

64B40-6A-4-2

PISTONS, RINGS, PISTON RING AND CONNECTING RODS

The piston is cast aluminum alloy, and has two compression rings and one oil ring.
Among two compression rings (top and 2nd rings) the outer surface of the top ring and the 2nd ring is plated with hard chromium for improvement in abrasion resistance.
The oil ring consists of two rails and one spacer.
The piston pin is offset 0.5 mm towards the major thrust side. This allows a gradual change in thrust pressure against the cylinder wall as the piston travels its path. Pins, made of chromium steel, have a floating fit in the pistons and connecting rods.
The connecting rods are made of forged steel, and the rod bearings are of precision insert type.

64B40-6A-4-3

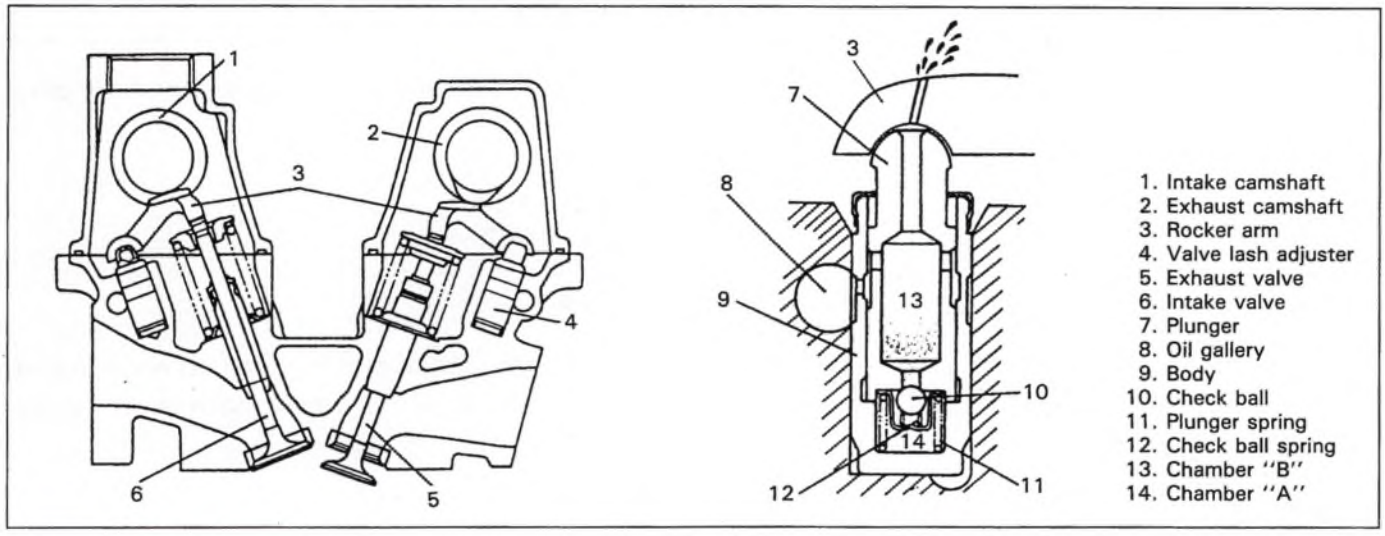
CYLINDER HEAD, VALVE TRAIN AND HYDRAULIC VALVE LASH ADJUSTER

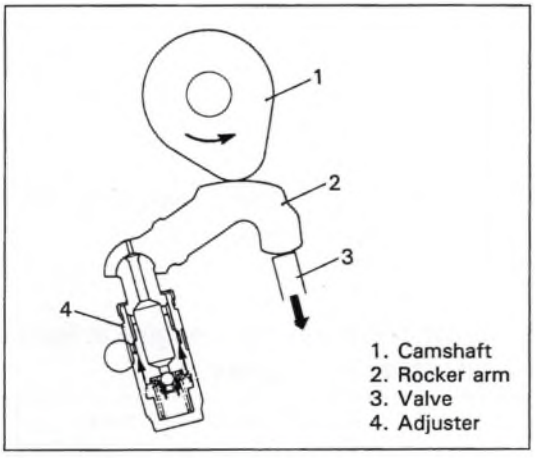
The cylinder head is made of cast aluminum alloy and has three combustion chambers arranged in-line. The combustion chamber is pentaroof type (its section is trapezoid but the surface has five faces and is shaped like a roof) and a spark plug is positioned in the center of combustion chamber and between intake ports and exhaust ports.

The double overhead camshafts (intake and exhaust) driven by the crankshaft through the timing belt is mounted on the cylinder head. Each of them has six cams and they operate the intake valves and exhaust valves respectively via the rocker arm and hydraulic valve lash adjuster.

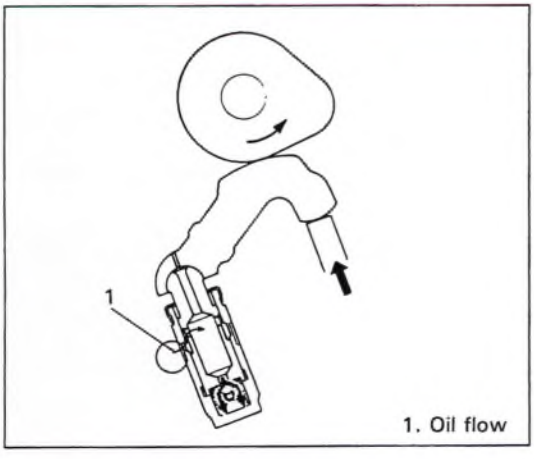
The hydraulic valve lash adjuster is installed to rocker arm at its fulcrum and automatically adjusts valve lash to "0" (zero) all the time.

OPERATION OF HYDRAULIC VALVE LASH ADJUSTER

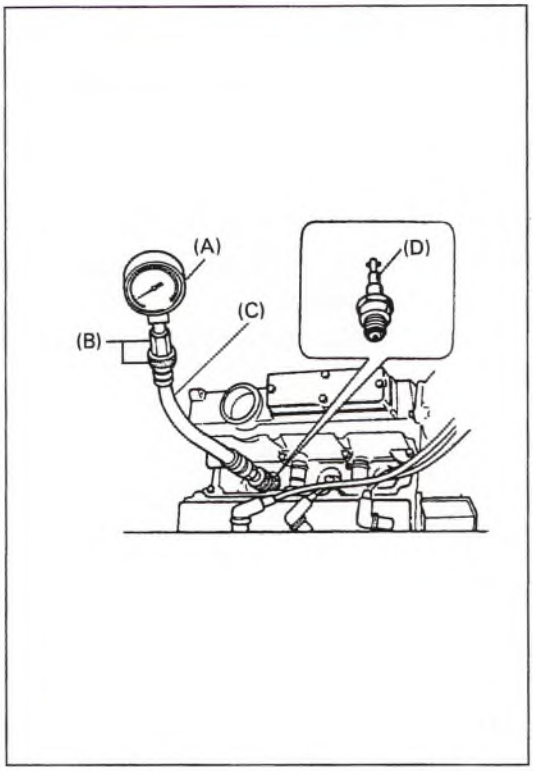


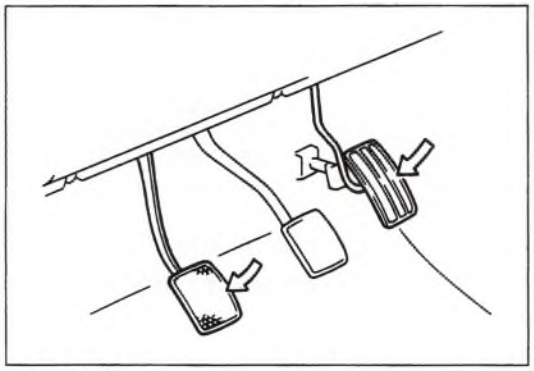


1) When the cam starts pushing rocker arm, a load is applied to the plunger of the adjuster, thereby oil pressure in chamber "A" increases.
 Then a small amount of oil leaks from chamber "A" through the gap between the plunger and body but the volume of chamber "A" hardly changes because compression time is very short. Thus, adjuster serves as the fulcrum of the rocker arm and the valve starts lifting.



2) When the cam stops pushing the rocker arm, the rocker arm and plunger of the adjuster are pushed up by the plunger spring force.
 If the volume in chamber "A" increases in this state (the gap between the cam and rocker arm increases), oil in chamber "B" pushes the check ball open and flows into chamber "A".





64B40-6A-6-3

ON-VEHICLE SERVICE

COMPRESSION CHECK

Check compression pressure on all three cylinders as follows:

1) Warm up engine.
2) Stop engine after warming up.
3) Remove all spark plugs.
4) Disconnect ignition coil wire harness at coupler.

WARNING:
Failure in disconnecting ignition coil coupler can cause spark to occur in engine room possibly resulting in a dangerous explosion.

5) Install special tool (Compression gauge) into spark plug hole.

Special Tool
(A): 09915-64510-001
(B): 09915-64510-002
(C): 09915-64530
(D): 09915-64550

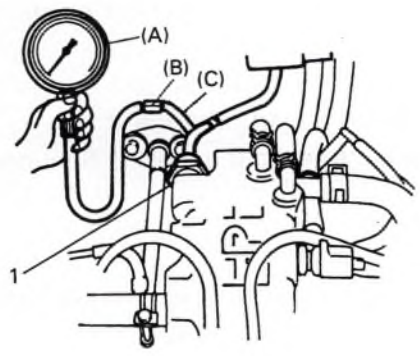
6) Disengage clutch (to lighten starting load on engine) and depress accelerator pedal all the way to make throttle valve full-open.

7) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE:
For measuring compression pressure, crank engine at least 250 r/min. by using fully charged battery.

	Compression pressure
Standard	1200 kPa (12.0 kg/cm²)
Limit	900 kPa (9.0 kg/cm²)
Max. difference between any two cylinders	100 kPa (1.0 kg/cm²)

8) Carry out steps 5) through 7) on each cylinder to obtain three readings.
9) After checking, connect coupler of ignition coil and install spark plugs.



1. Gas filter

ENGINE VACUUM CHECK

The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

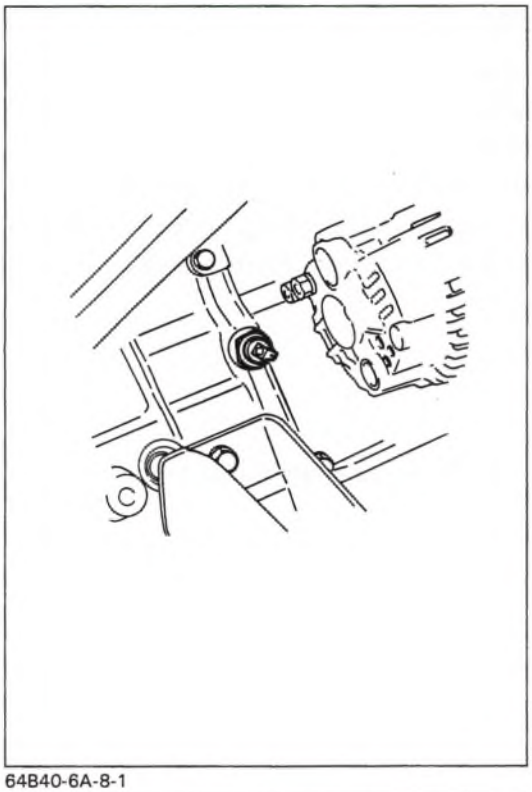
1) Warm up engine to normal operating temperature.
2) With engine stopped, remove blind plug from gas filter and connect hose and special tool (vacuum gauge and joint) to gas filter.

Special Tool
(A): 09915-67310
(B): 09918-08210
(C): 09358-35754-300 (Hose as spare part)

3) Run engine at specified idle speed (see section 6E), and read vacuum gauge. Vacuum should be within following specification.

Vacuum specification: 31—41 cm·Hg at specified idling speed

4) After checking, install blind plug to gas filter.



64B40-6A-8-1

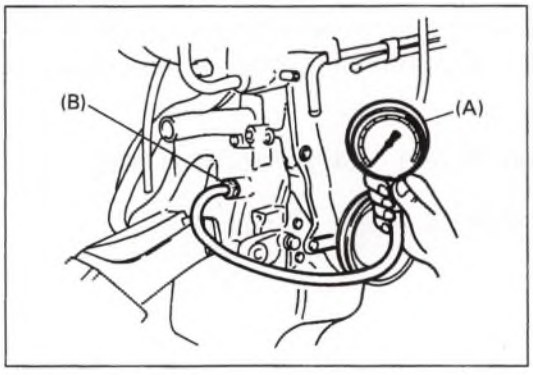
OIL PRESSURE CHECK

NOTE:

Prior to checking oil pressure, check the following.

- **Oil level in oil pan.**
 If oil level is low, add oil up to Full level hole on oil level gauge.
- **Oil quality.**
 If oil is discolored, or deteriorated, change it.
 For particular oil to be used, refer to the table in Section 0B.
- **Oil leaks.**
 If leak is found, repair it.

1) Disconnect negative cable at battery and remove generator from engine referring to SECTION 6H.
2) Remove oil pressure switch from cylinder block.



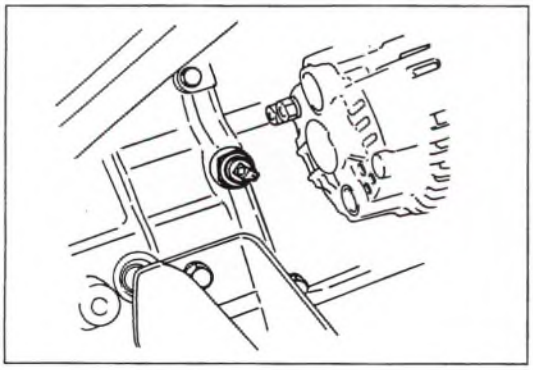
3) Install special tool (Oil pressure gauge) to vacated threaded hole.

 Special Tool
 (A): 09915-77310
 (B): 09915-78211

4) Reinstall generator to engine and connect negative cable to battery.
5) Start engine and warm it up to normal operating temperature.
6) After warming up, raise engine speed to 4,000 r/min and measure oil pressure.

 Oil pressure specifications: 2.7—3.7 kg/cm^2
 at 4,000 r/mim (rpm)

7) After checking oil pressure, stop engine and remove generator and oil pressure gauge.



8) Before reinstalling oil pressure switch, be sure to wrap its screw threads with a sealing tape and tighten switch to specified torque.

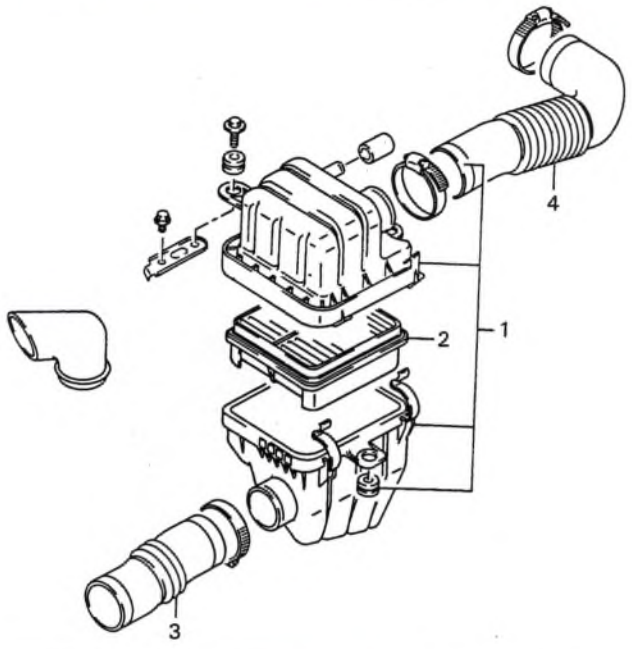
 Tightening Torque
 (a): 12—15 N·m (1.2—1.5 kg-m)

 NOTE:
 If sealing tape edge is bulged out from screw threads of switch, cut it off.

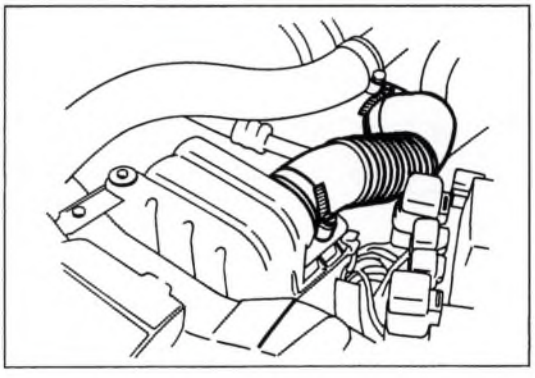
9) Install generator to engine, start engine and check for oil leakage.

AIR CLEANER ELEMENT

This air cleaner element is of dry type. Remember that it needs cleaning according to following procedure.

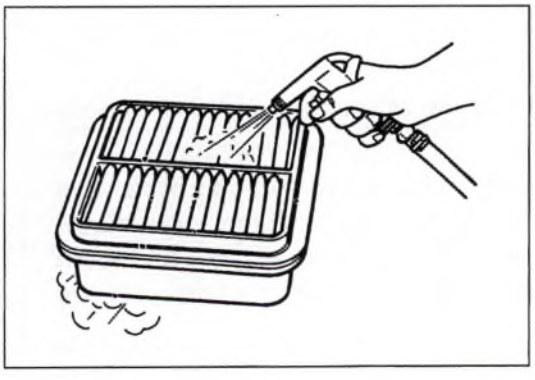


1. Air cleaner assembly
2. Element
3. Inlet hose
4. Outlet hose



REMOVAL

1) Disconnect outlet hose from air cleaner case.
2) Remove air cleaner element from air cleaner case.



INSPECTION

Check air cleaner element for dirt.

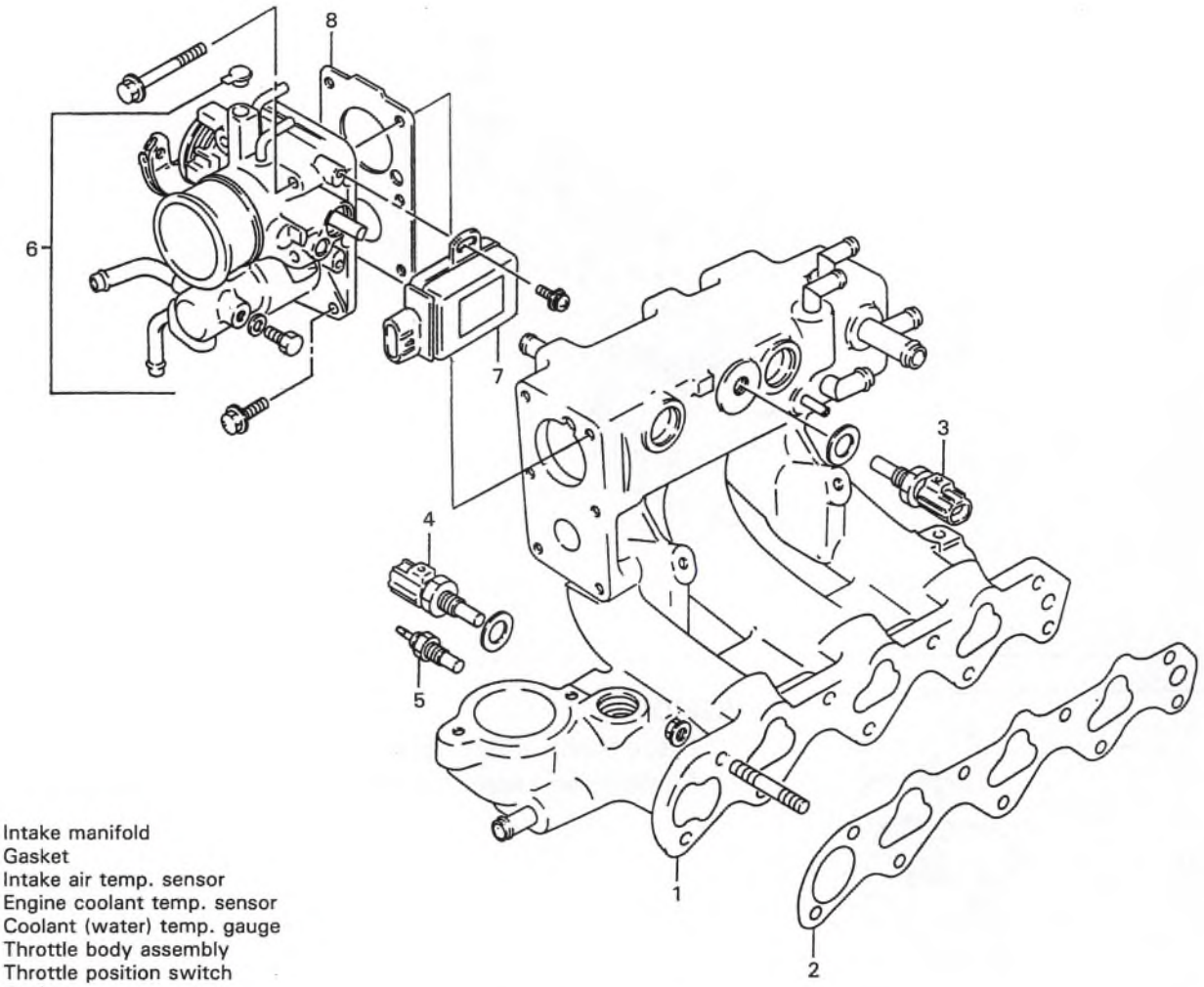
CLEAN

Blow off dust by using compressed air from air outlet side of element.

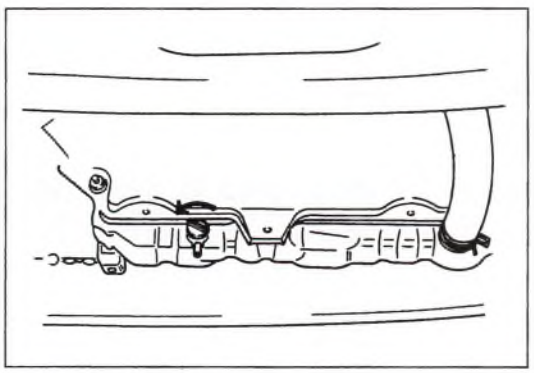
INSTALLATION

Reverse removal procedure for installation.

THROTTLE BODY AND INTAKE MANIFOLD



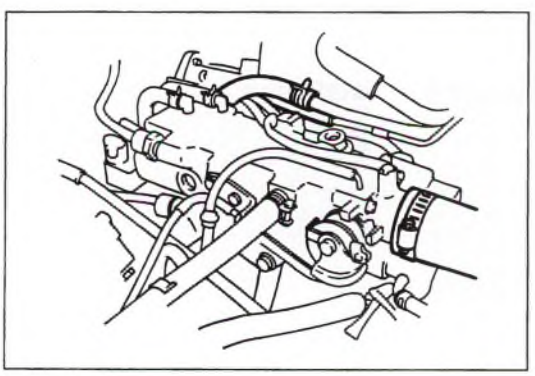
1. Intake manifold
2. Gasket
3. Intake air temp. sensor
4. Engine coolant temp. sensor
5. Coolant (water) temp. gauge
6. Throttle body assembly
7. Throttle position switch
8. Gasket



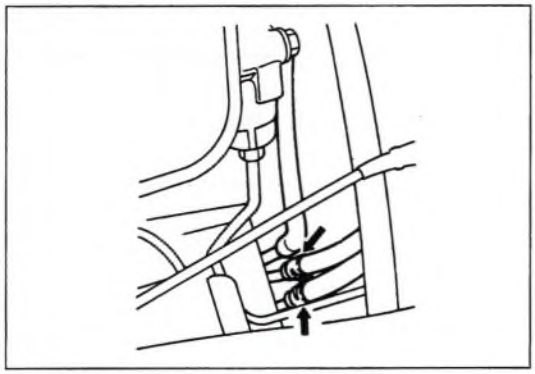
REMOVAL

1) Relieve fuel pressure according to procedure described under FUEL PRESSURE RELIEF PROCEDURE in SECTION 6.
2) Disconnect negative cable at battery and drain coolant.

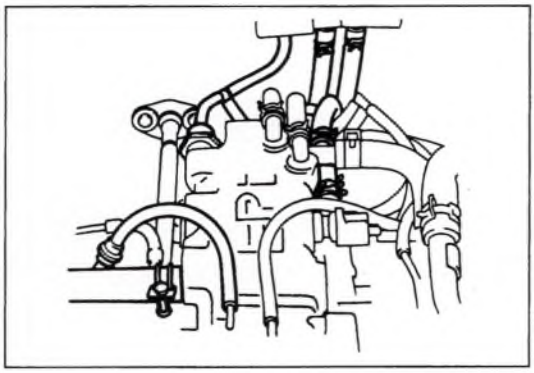
WARNING:
To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.



3) Disconnect inter-cooler outlet hose, air bypass valve hose and air bypass hose form intake manifold.



4) Disconnect fuel feed hose and return hose from pipes.
5) Disconnect coolant (water) hoses from throttle body and intake manifold.
6) Remove fuel delivery pipe and injectors.



7) Disconnect vacuum hoses from intake manifold.
8) Disconnect accelerator cable from throttle body.
9) Remove generator and its adjusting arm.
10) Disconnect electric wires at their couplers respectively.
11) Remove intake manifold with throttle body from cylinder head.

INSTALLATION

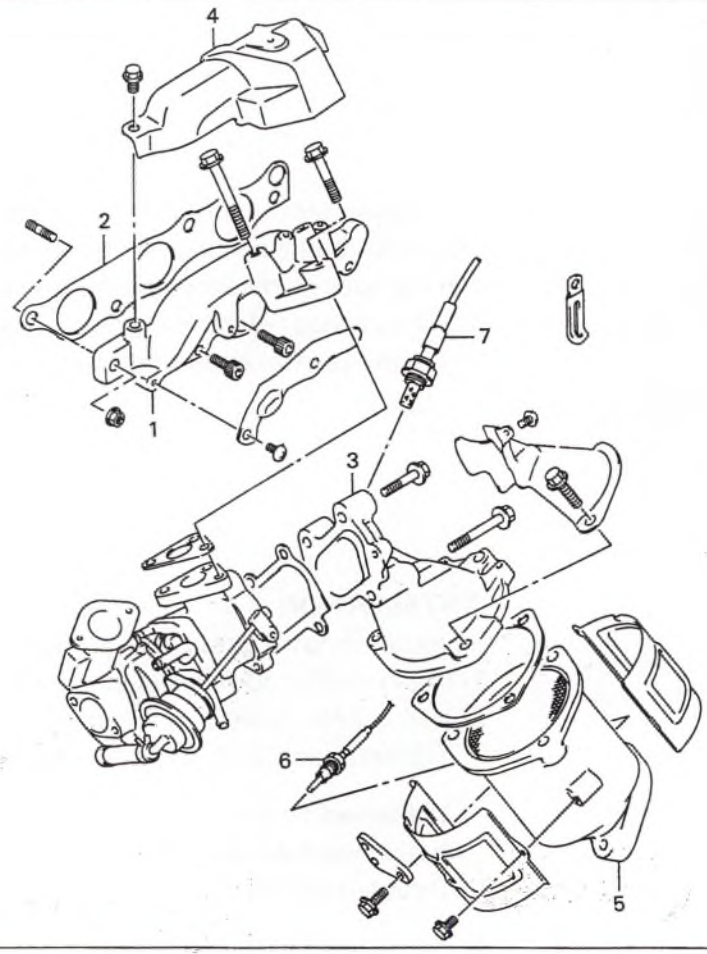
Reverse removal procedure noting the following points.
1) Clean mating surfaces of intake manifold and cylinder head.
2) Use a new gasket.
3) Tighten each belt and nut to specified torque.

Tightening Torque
Intake manifold nut: 8—12 N·m (0.8—1.2 kg-m)
Throttle body nut : 12—18 N·m (1.2—1.8 kg-m)

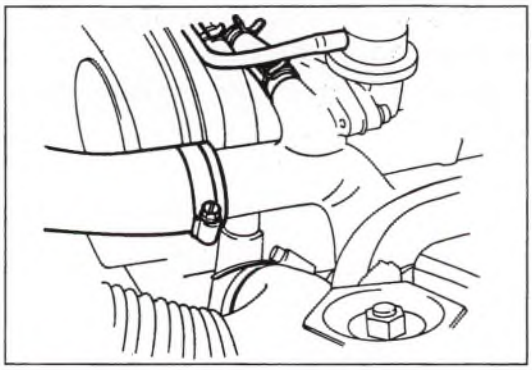
4) Connect couplers securely.
5) Adjust accelerator cable play, referring to SECTION 6E.
6) Refill cooling system, referring to SECTION 6B.
7) Upon completion of installation, start engine and check for fuel leaks and coolant leaks.

EXHAUST MANIFOLD

WARNING:
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

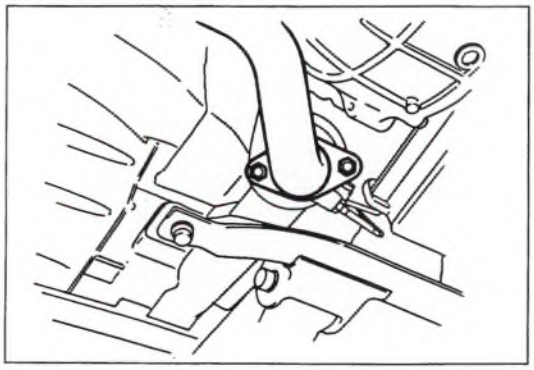


1. Exhaust manifold
2. Gasket
3. Turbo outlet pipe
4. Cover
5. Catalyst case
6. Catalyst thermo fuse
7. Oxygen sensor

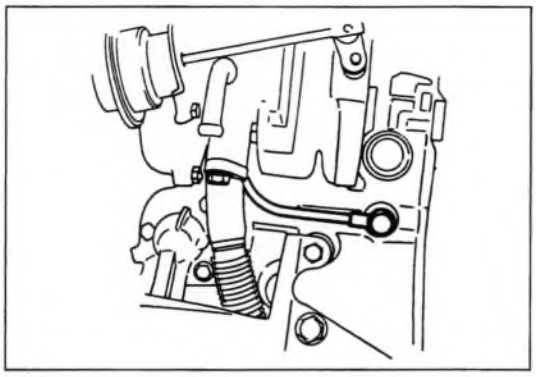


REMOVAL

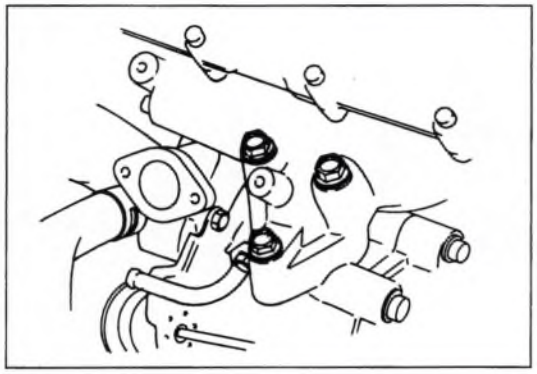
1) Remove battery and its tray from vehicle and drain coolant.
2) Disconnect vacuum hose and inter-cooler inlet hose from turbo outlet air pipe.
3) Remove turbo outlet air pipe.
4) Remove exhaust manifold cover.
5) Disconnect couplers of thermo fuse and oxygen sensor respectively.
6) Remove under cover from vehicle.



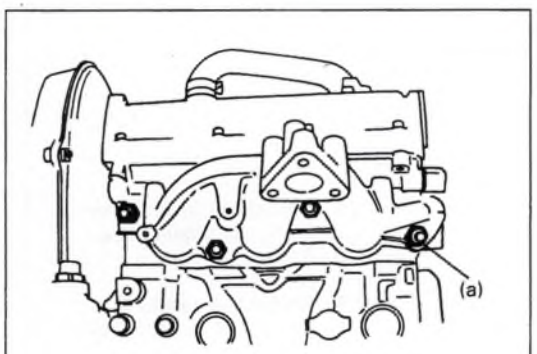
7) Disconnect exhaust No.1 pipe from catalyst case.

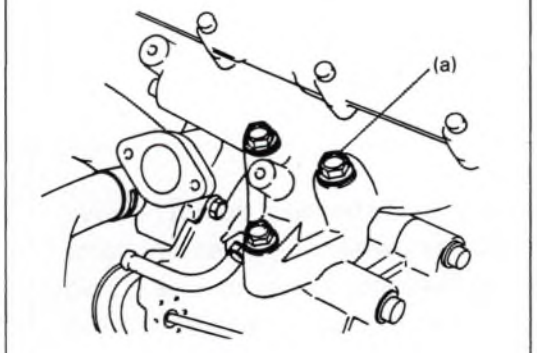


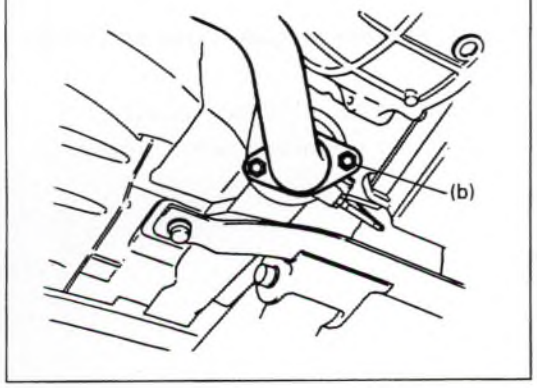
8) Remove turbo oil intake pipe from turbocharger and cylinder block.



9) Remove catalyst case from turbo air outlet pipe.
10) Remove turbocharger from exhaust manifold.
11) Remove exhaust manifold from cylinder head.







INSTALLATION

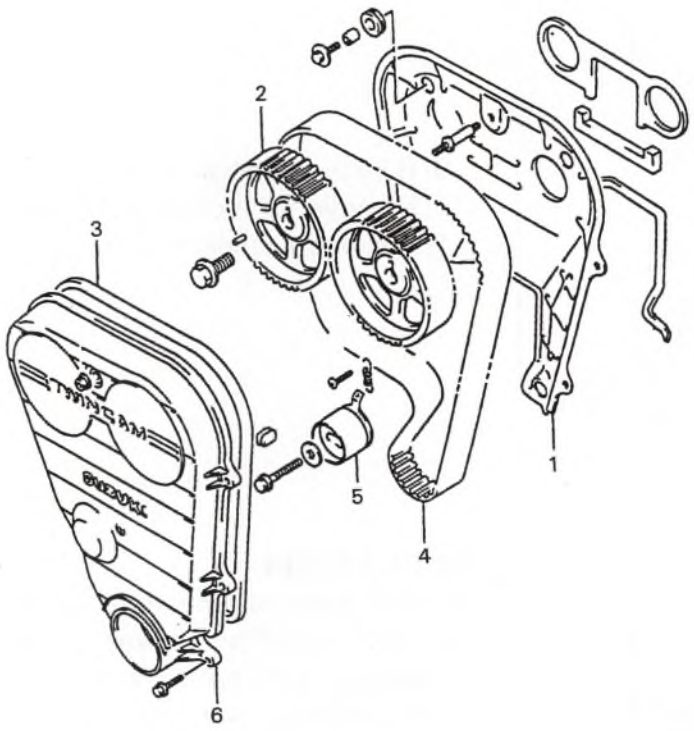
Reverse removal procedure noting the following points.

1) Before installing gasket, check it for deterioration or damage, and replace as necessary.
2) Tighten each bolt and nut to specified torque.

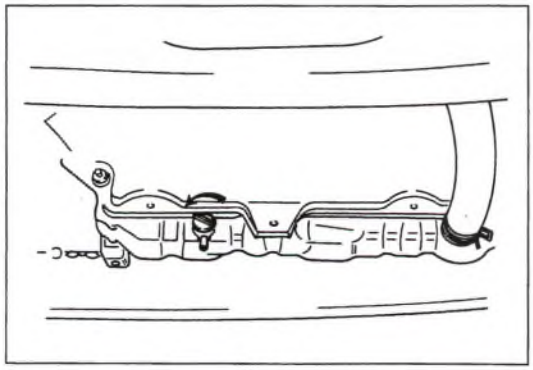
Tightening Torque
(a): 18—28 N·m (1.8—2.8 kg-m)
(b): 40—60 N·m (4.0—6.0 kg-m)

3) Connect couplers securely.
4) Refill cooling system, referring to SECTION 6B.
5) Upon completion of installation, start engine and check for oil leaks, coolant leaks and exhaust gas leaks.

TIMING BELT AND BELT TENSIONER



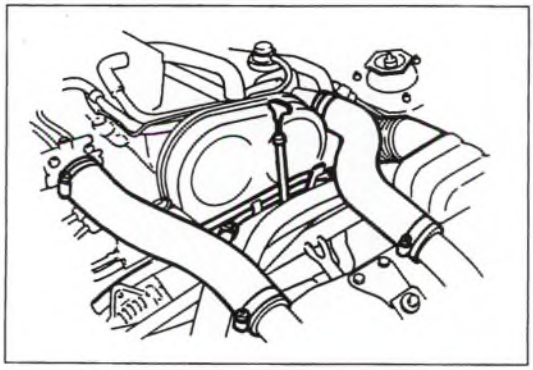
1. Timing belt inside cover
2. Camshaft timing pulley
3. Outside cover seal
4. Timing belt
5. Timing belt tensioner
6. Timing belt outside cover



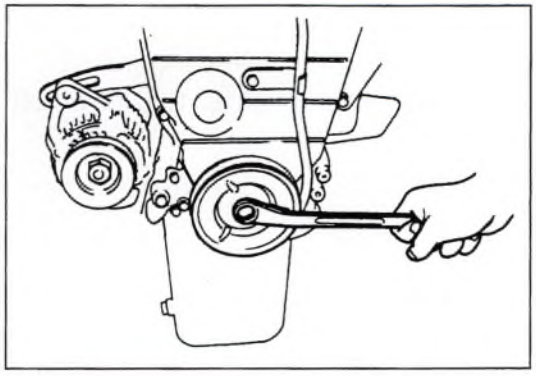
REMOVAL

1) Disconnect negative cable at battery.
2) Drain coolant.

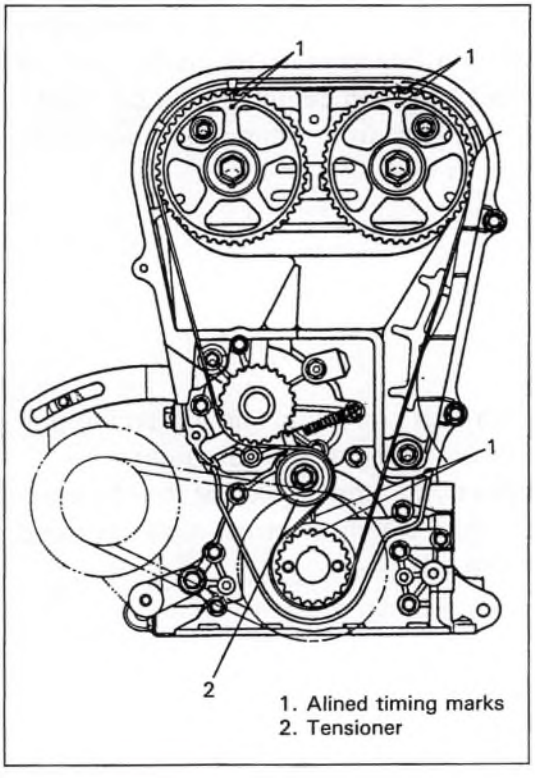
WARNING:
To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.



3) Remove intercooler hoses, air cleaner inlet hose and radiator inlet hose.
4) Remove oil level gauge and turbo & oil cooler pipe.
5) Remove under cover and front stabilizer bush mounting bolts.



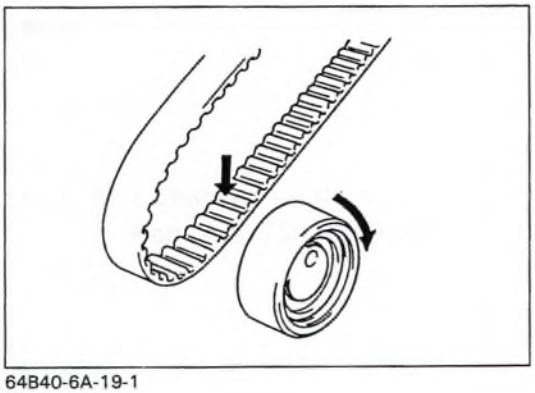
6) Remove crankshaft pulley.
7) Remove timing belt outside cover.



1. Alined timing marks
2. Tensioner

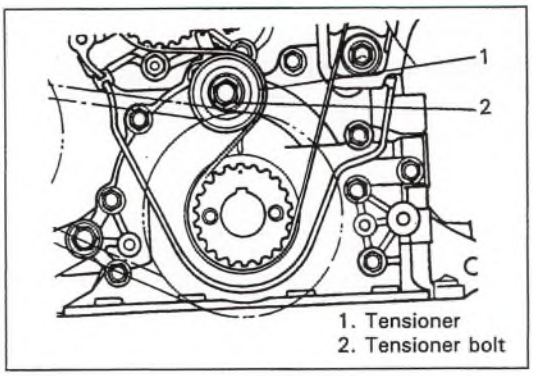
8) Set camshaft timing pulleys and crankshaft timing pulley as shown in figure at the left by turning crankshaft.
9) Remove timing belt tensioner and timing belt.

CAUTION:
- **After timing belt is removed, never turn each pulley. If turned, interference may occur between piston and valves, and part related to piston and valves may be damaged.**
- **Never bend timing belt.**



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INSPECTION
- Check timing belt for wear or crack. Replace it as necessary.
- Check tensioner for smooth rotation and rattle.

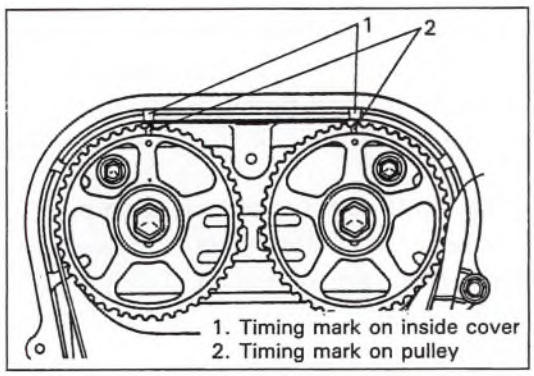


1. Tensioner
2. Tensioner bolt

INSTALLATION

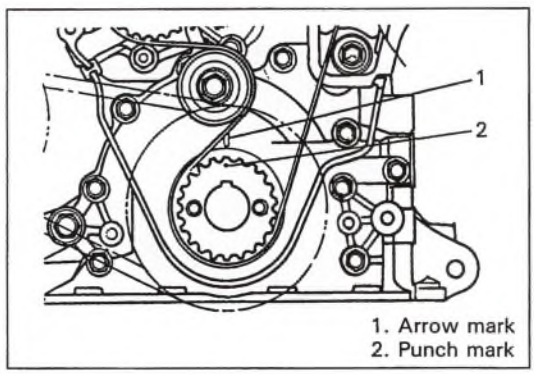
Reverse removal procedure noting the following points.

1) Install timing belt tensioner and hand-tighten tensioner bolt at this time.
 Don't tighten it with wrench yet.



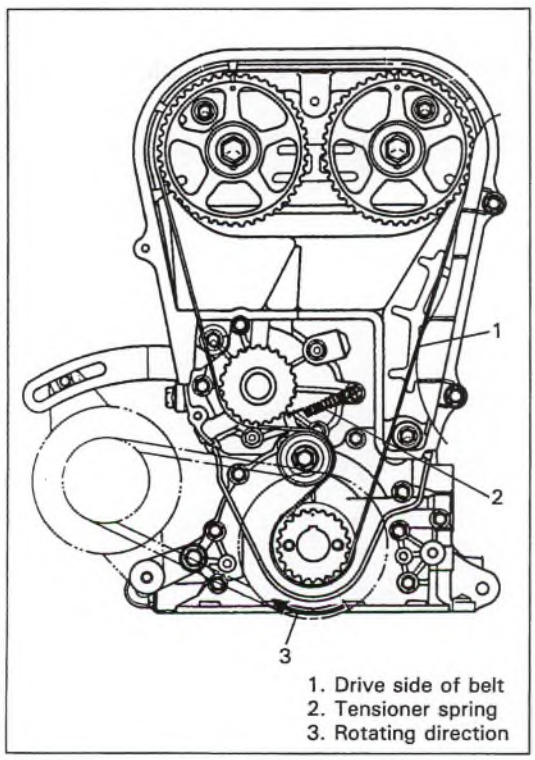
1. Timing mark on inside cover
2. Timing mark on pulley

2) Check that timing mark on each camshaft timing pulley (IN & EX) is aligned with timing mark on inside cover. If not, align two marks by turning camshaft but be careful not to turn it more that 60° from timing mark on inside cover on both right and left.



1. Arrow mark
2. Punch mark

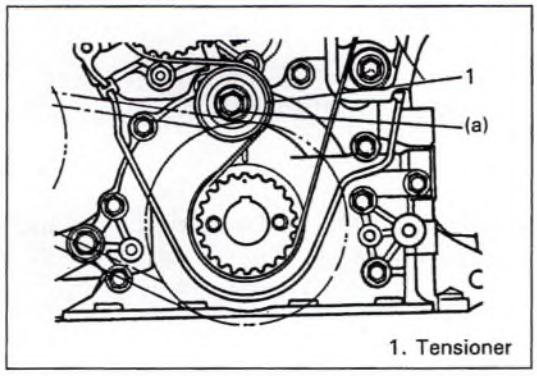
3) Check that punch mark on crankshaft timing timing pulley is aligned with arrow mark on oil pump case.
 If not, align two marks by turning crankshaft but be careful not to turn it more than 60° from arrow mark on pump case on both right and left.



1. Drive side of belt
2. Tensioner spring
3. Rotating direction

4) Install timing belt on three pulleys in such a way that drive side of belt is free from any slack.
 And then install tensioner spring as shown in figure.

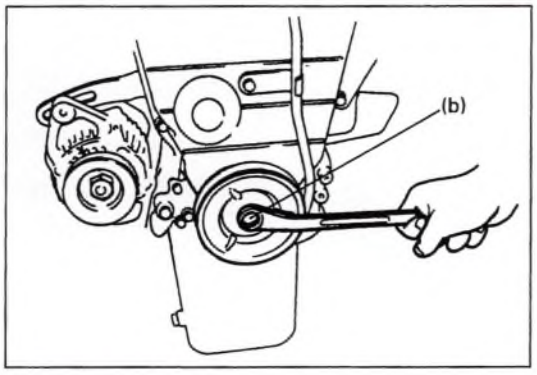
NOTE:
When installing timing belt, match arrow mark (➡) on timing belt with rotating direction of crankshaft.



1. Tensioner

5) To take up slack of timing belt, turn crankshaft two rotations clockwise after installing it. After making sure that belt is free from slack, tighten tensioner bolt to specified torque.
Then confirm again that three sets of marks are aligned respectively.

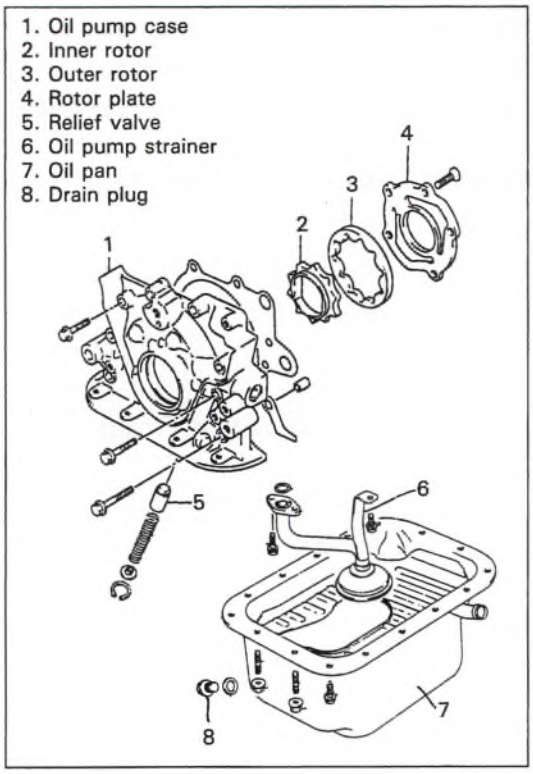
Tightening Torque
(a): 15—23 N·m (1.5—2.3 kg-m)



6) Tighten crankshaft pulley bolt to specified torque.

Tightening Torque
(b): 65—75 N·m (6.5—7.5 kg-m)

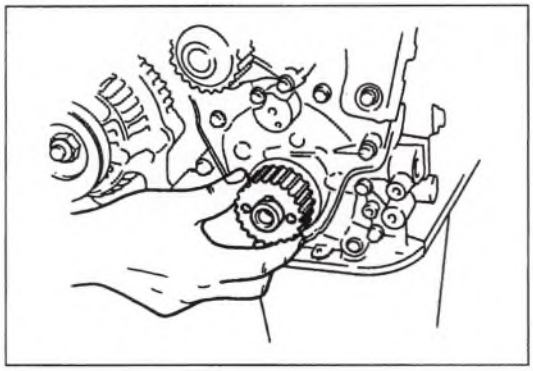
7) Refill cooling system, referring to SECTION 6B.
8) Upon completion of installation, start engine and check for coolant leaks.



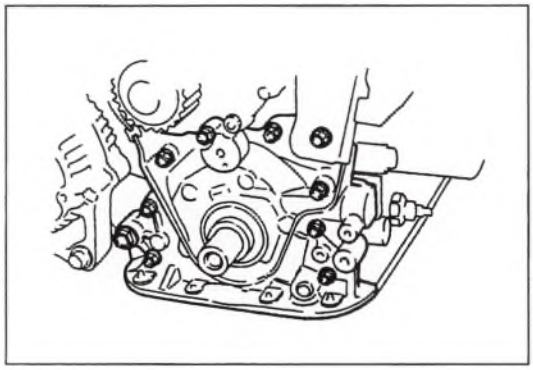
OIL PAN AND OIL PUMP

REMOVAL

1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Drain engine oil.
4) Remove crankshaft pulley, timing belt outside cover and timing belt as previously outlined.



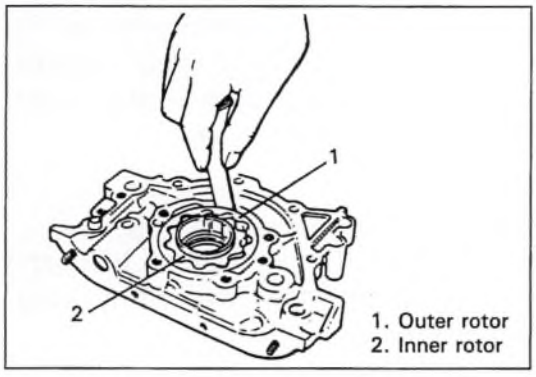
5) Remove crankshaft timing pulley.
6) Dismount transmission from engine, referring to SECTION 7A.



7) Remove oil pump assembly from cylinder block.

INSPECTION

- Check oil seal lip for fault or other damage. Replace as necessary.
- Check outer and inner rotors, rotor plate and oil pump case for excessive wear or damage.

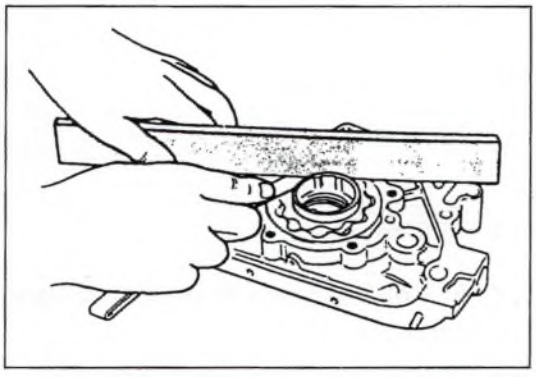


Radial Clearance

Check radial clearance between outer rotor and case, using thickness gauge.

If clearance exceeds its limit, replace outer rotor or case.

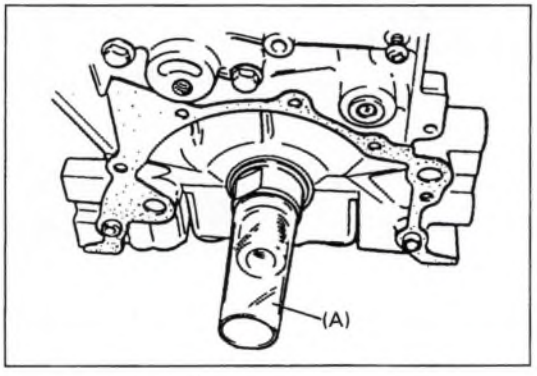
Radial clearance between:	Limit on radial clearance
Outer rotor and case	0.310 mm



Side Clearance

Using straight edge and thickness gauge, measure side clearance.

Limit on side clearance	0.15 mm

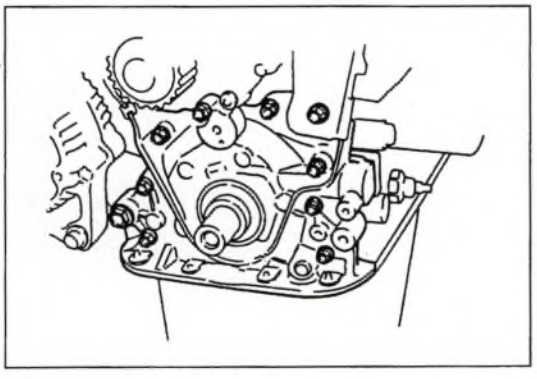


INSTALLATION

Reverse removal procedure noting the following points.

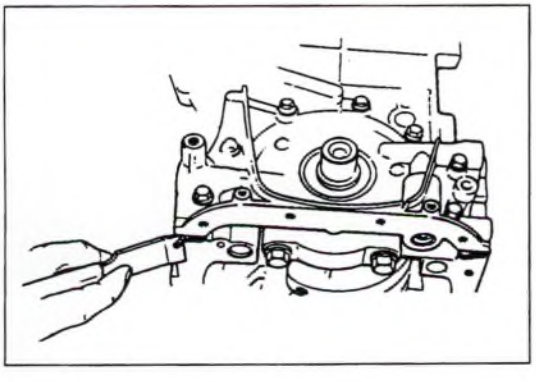
1) Install two oil pump pins and oil pump gasket to cylinder block. Use a new gasket.
2) To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit special tool (Oil seal guide) to crankshaft, and apply engine oil to special tool.

Special Tool
(A): 09926-18210

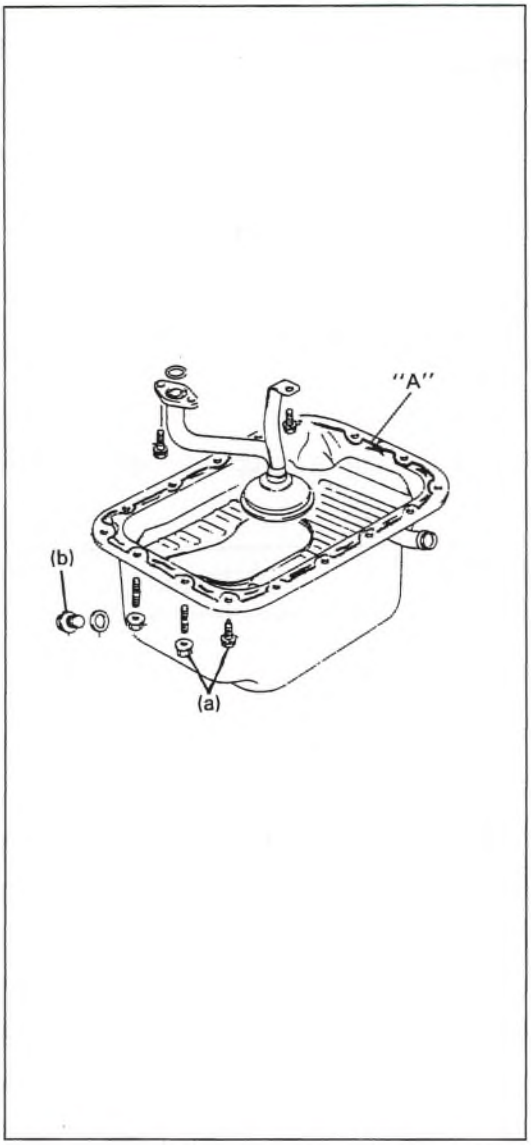


3) After installing oil pump, check to be sure that oil seal lip is not upturned, and then remove special tool.

Tightening Torque
(a): 9—12 N·m (0.9—1.2 kg-m)



4) Edge of oil pump gasket might bulge out.
If it does, cut it off with a sharp knife, making edge smooth and flush with end faces of pump case and cylinder block.



5) Clean mating surfaces of oil pan and cylinder block. Remove oil, old sealant, and dusts from mating surfaces. After cleaning, apply silicon type sealant to oil pan mating surface continuously as shown in figure.

"A": Sealant 99000-31150

6) After fitting oil pan to block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time.
Tighten bolts and nuts to specified torque.

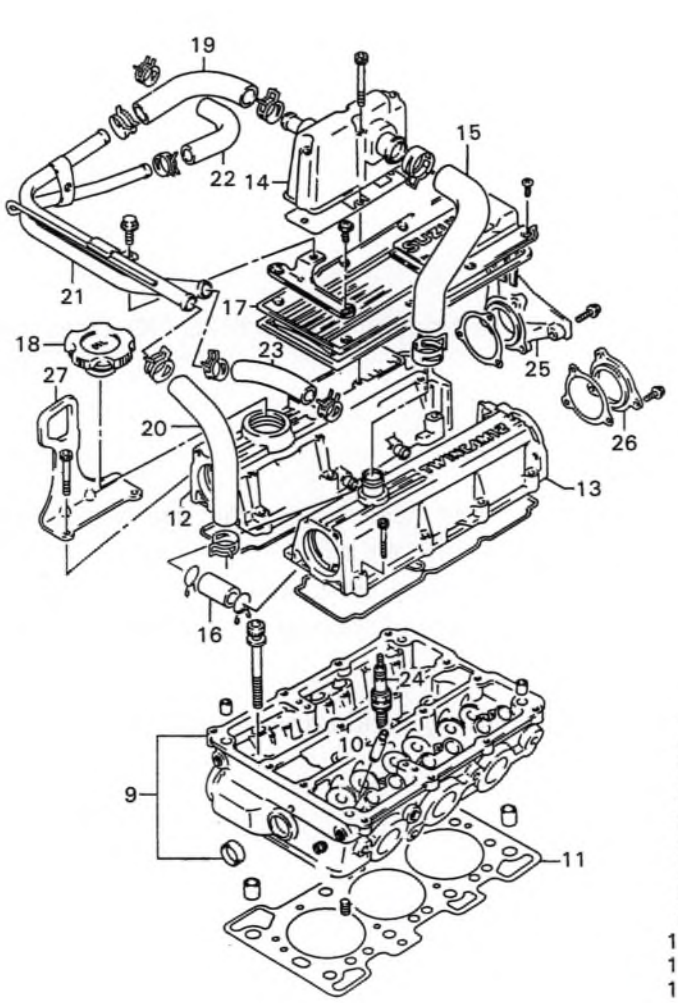
Tightening Torque
(a): 9—12 N·m (0.9—1.2 kg-m)

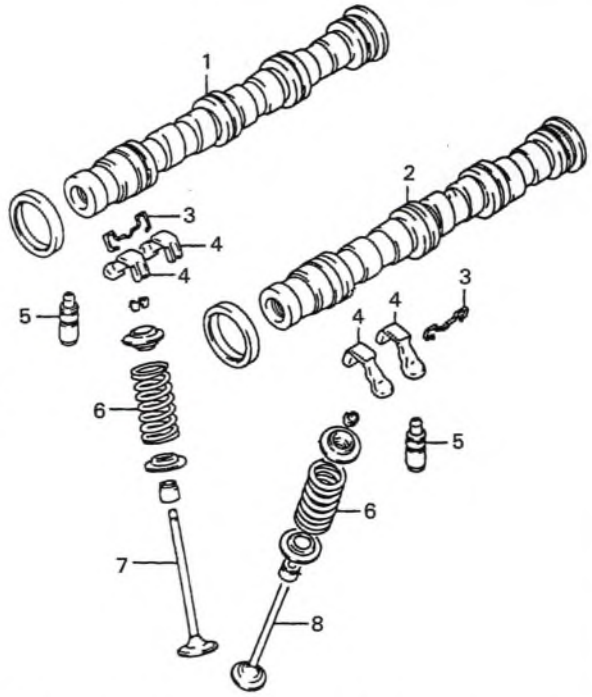
7) Tighten drain plug to specified torque.

Tightening Torque
(b): 30—40 N·m (3.0—4.0 kg-m)

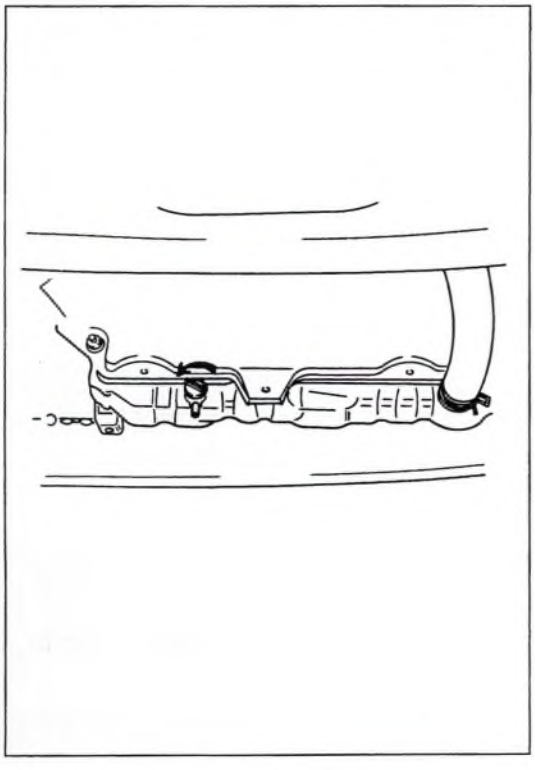
8) Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.
9) Refill cooling system, referring to SECTION 6B.
10) Upon completion of installation, start engine and check for oil leaks and coolant leaks.

CYLINDER HEAD





1. Camshaft (IN)
2. Camshaft (EX)
3. Rocker arm clamp
4. Rocker arm
5. Valve lash adjuster
6. Valve spring
7. Intake valve
8. Exhaust valve
9. Cylinder head
10. Valve guide
11. Cylinder head gasket
12. Camshaft housing (IN)
13. Camshaft housing (EX)
14. Breather case
15. Breather case hose
16. Oil drain hose
17. Camshaft housing cover
18. Oil filler cover
19. Breather hose
20. Breather hose
21. Breather pipe
22. IAC valve hose
23. IAC valve hose
24. Spark plug
25. Distributor case
26. Camshaft thrust plate
27. Engine hook

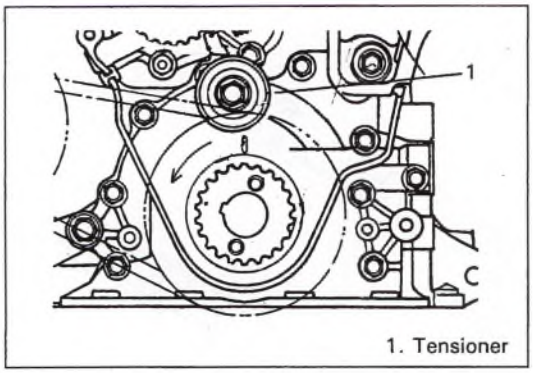


REMOVAL

1) Relieve fuel pressure according to procedure described under FUEL PRESSURE RELIEF PROCEDURE in SECTION 6.
2) Disconnect negative cable at battery.
3) Drain coolant.

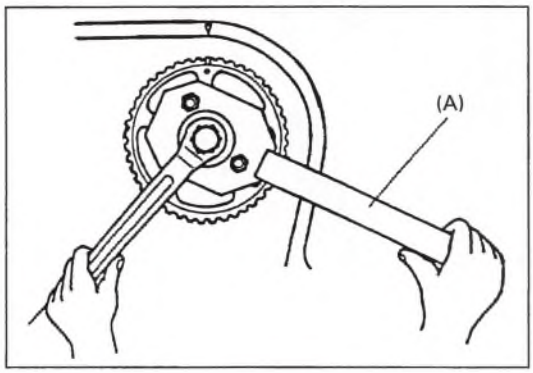
WARNING:
To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.

4) Remove timing belt as previously outlined.



1. Tensioner

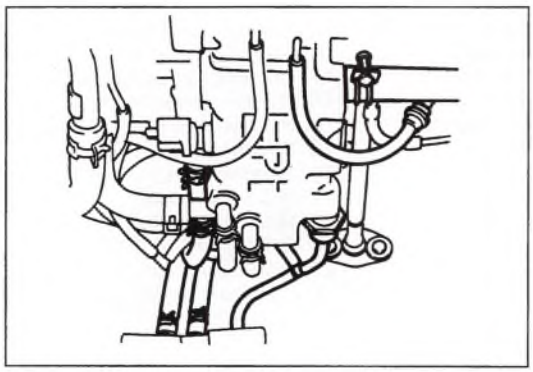
5) After removing timing belt, set key on crankshaft in position as shown by turning crankshaft. This is to prevent interferance between valves and piston.



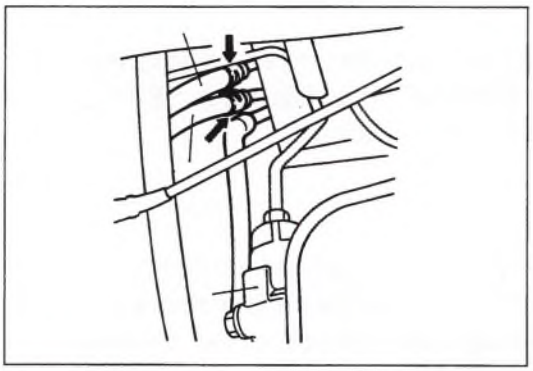
6) Remove camshaft timing pulleys (IN & EX) using special tool.

Special Tool
(A): 09917-68220

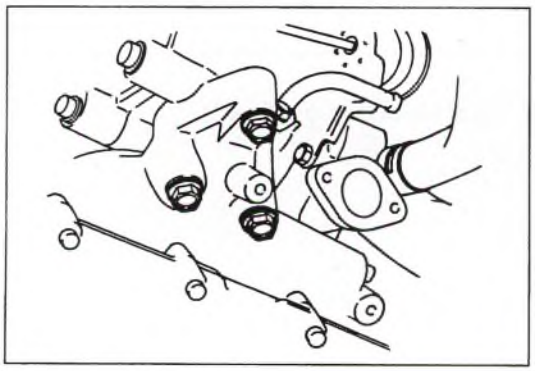
7) Remove timing belt inside cover, dust seal and grommet.
8) Remove turbo outlet air pipe.
9) Remove exhaust manifold cover.
10) Disconnect couplers of thermo fuse and oxygen sensor respectively.



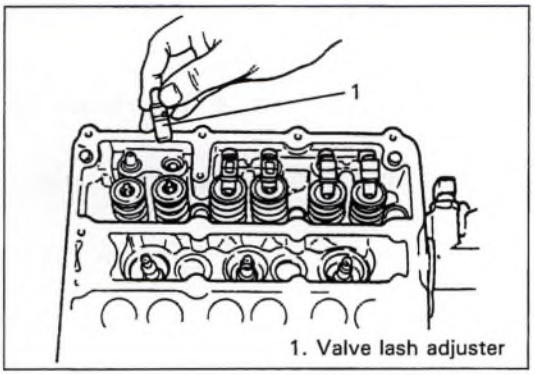
11) Remove turbocharger mounting bolts.



12) Disconnect fuel feed hose and fuel return hose from pipes.
13) Disconnect coolant (water) hoses from throttle body and intake manifold.



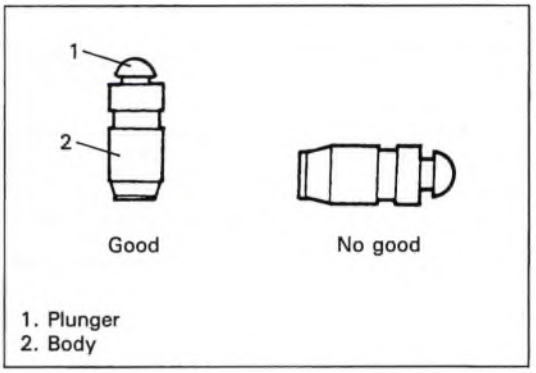
14) Disconnect vacuum hoses from intake manifold.
15) Disconnect accelerator cable from throttle body.
16) Remove camshaft housing cover.
17) Remove distributor assembly.
18) Remove camshaft housings (IN & EX) and then camshafts (IN & EX) respectively.
19) Remove cylinder head bolts using 8 mm hexagon wrench bit.
20) Remove cylinder head with intake manifold, exhaust manifold from cylinder block.



1. Valve lash adjuster

DISASSEMBLY

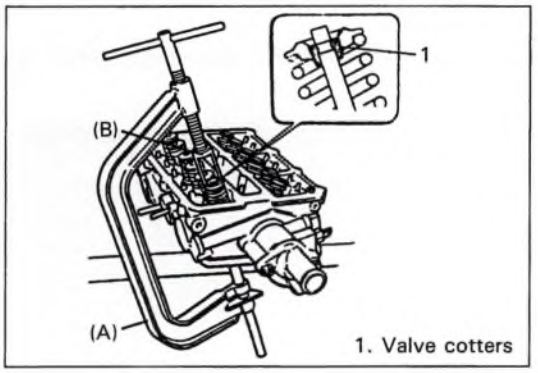
1) For ease in servicing cylinder head, remove intake manifold with throttle body, exhaust manifold distributor case.
2) Remove rocker arms and valve lash adjusters.



1. Plunger
2. Body

NOTE:

- **Never disassemble hydraulic valve lash adjuster.**
- **Don't apply force to plunger or body of adjuster, for oil in high pressure chamber in adjuster will leak.**
- **Immerse removed adjuster in clean engine oil and keep it there till reinstalling it so as to prevent oil leakage. If it is left in air, place it with its body facing down. Don't place on its side.**



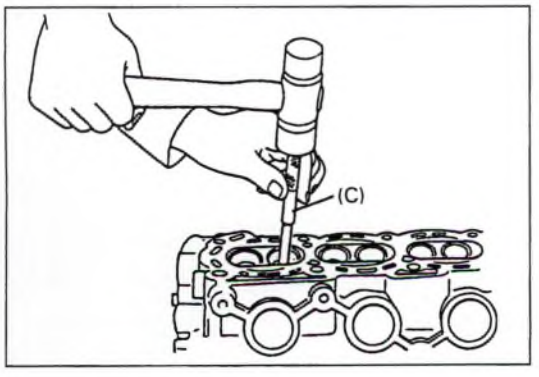
1. Valve cotters

3) Using special tool (Valve lifter), compress the valve spring and then remove valve cotters by using special tool (Forceps).

Special Tool
(A): 09916-14510
(B): 09916-48210
Forceps: 09916-84510

4) Release special tool, and remove spring retainer and valve spring.
5) Remove valve from combustion chamber side.
6) Remove valve stem seal from valve guide, and then valve spring seat.

NOTE:
Do not reuse seal once disassembled. Be sure to use new seal when assembling.

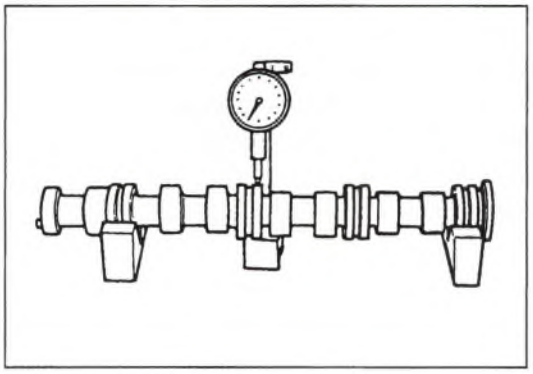


7) Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

NOTE:
Do not reuse valve guide once disassembled. Be sure to use new valve guide (Oversize) when assembling.

Special Tool
(C): 09916-44910

8) Place disasembled parts except valve stem seal and valve guide in order, so that they can be installed in their original positions.

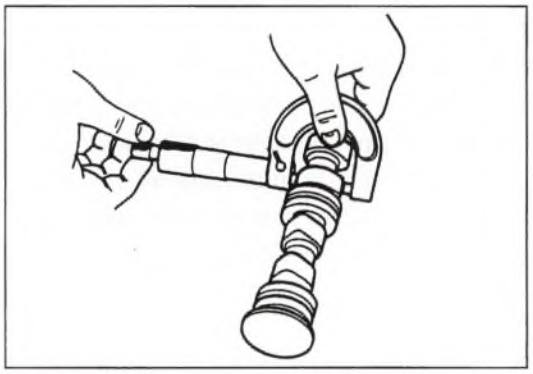


INSPECTION

Camshaft Runout

Set camshaft between two "V" blocks, and measure its runout by using a dial gauge.
If measured runout exceeds specified limit below, replace camshaft.

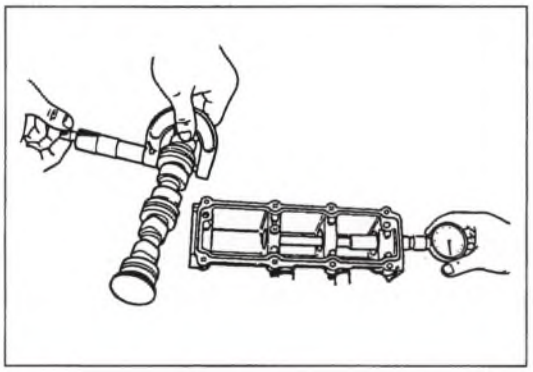
Runout limit: 0.10 mm



Cam Wear

Using a micrometer, measure cam height. If measured height is below its limit, replace camshaft.

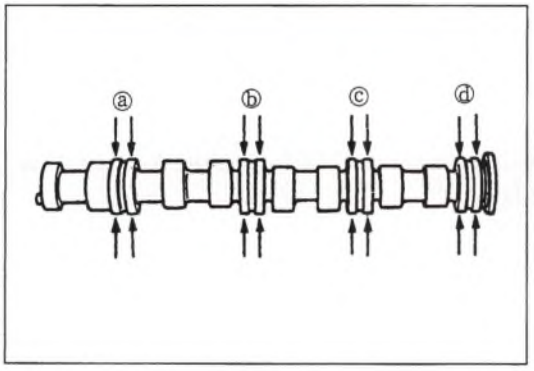
		Standard	Limit
Cam height	IN	30.151 mm	30.05 mm
	EX	30.167 mm	30.06 mm



Camshaft Journal Wear

Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.
If any malcondition is found, replace camshaft and camshaft housing as necessary.

Camshaft journal clearance
Standard: 0.040—0.076 mm
Limit : 0.10 mm



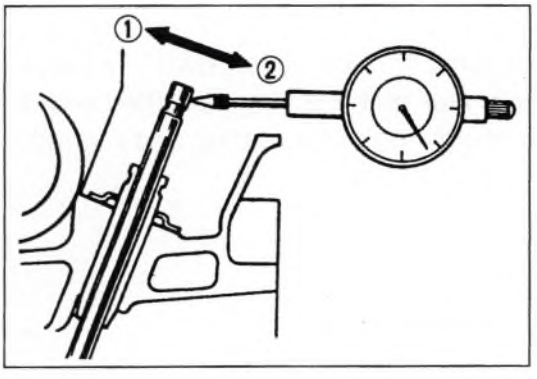
	Camshaft journal dia.	Journal bore dia.
ⓐ	35.740—35.760 mm	35.800—35.816 mm
ⓑ	35.940—35.960 mm	36.000—36.016 mm
ⓒ	36.140—36.160 mm	36.200—36.216 mm
ⓓ	36.340—36.360 mm	36.400—36.416 mm



Valve Guides

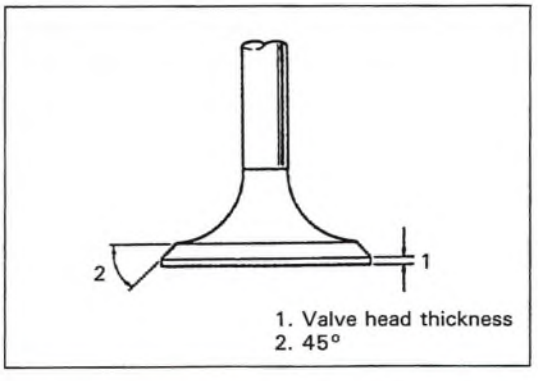
Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance. Be sure to take reading at more than one place along the length of each stem and guide.
If clearance exceeds limit, replace valve and valve guide.

Item		Standard	Limit
Valve stem diameter	In	5.465—5.480 mm	———
	Ex	5.440—5.455 mm	———
Valve guide I.D.	In & Ex	5.500—5.512 mm	———
Stem-to-guide clearance	In	0.020—0.047 mm	0.07 mm
	Ex	0.045—0.072 mm	0.09 mm



If bore gauge is not available, check end deflection of valve stem in place with a dial gauge rigged.
Move stem end in the directions ① and ② to measure the end deflection.
If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit	In	0.14 mm
	Ex	0.18 mm

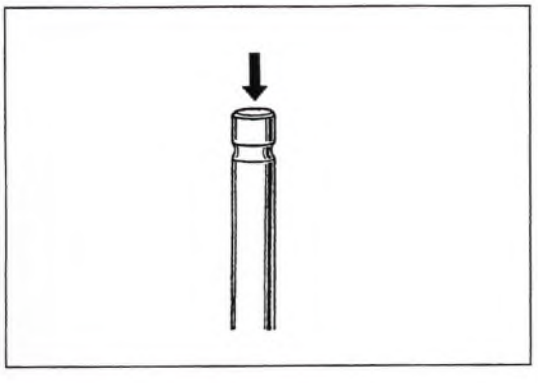


1. Valve head thickness
2. 45°

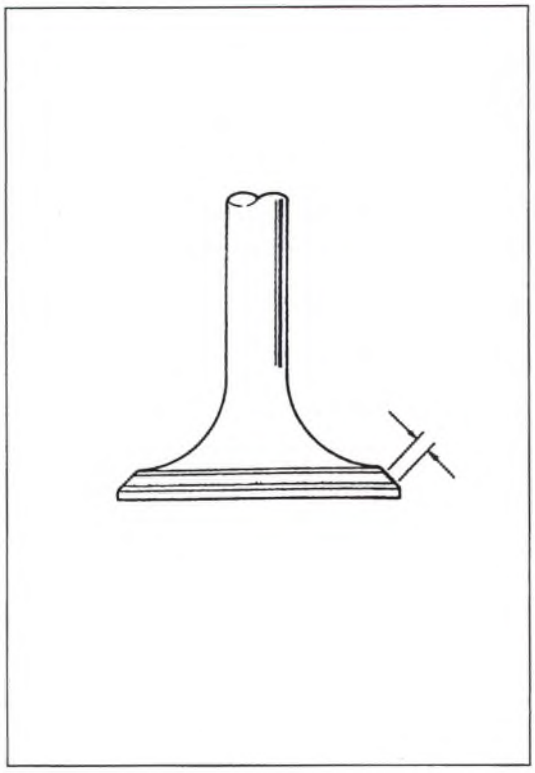
Valves

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure thickness of valve head. If measured thickness exceeds limit, replace valve.

Valve head thickness
Standard: IN 1.0 mm EX 1.2 mm
Limit : IN 0.6 mm EX 0.7 mm



- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not so much as to grind off its chamfer. When it is worn so much that its chamfer is gone, replace valve.

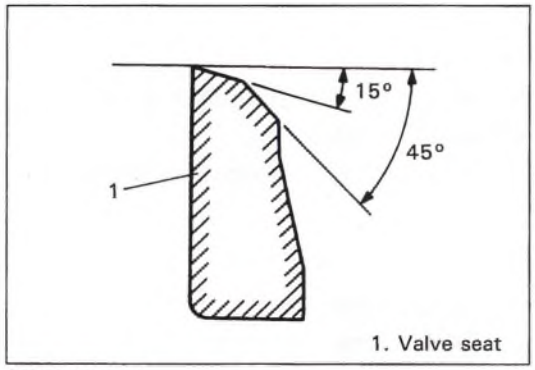


- Seating contact width:
 Produce a contact pattern on each valve in the usual manner, that is, by giving a uniform coat of Red-lead paste to valve seat and by rotatingly tapping each seat with valve head.
 Valve lapper (the tool used in valve lapping) must be used. The pattern produced on seating face of each valve must be a continuous ring without any break, and width of pattern must be within following specification.

Standard seating width revealed by contact pattern on valve face	In	1.1—1.3 mm
	Ex	

- Valve seat repair:
 A valve seat not producing uniform contact with its valve or showing seating contact that is off the specified width must be repaired by regrinding or by cutting and regrinding and finished by lapping.

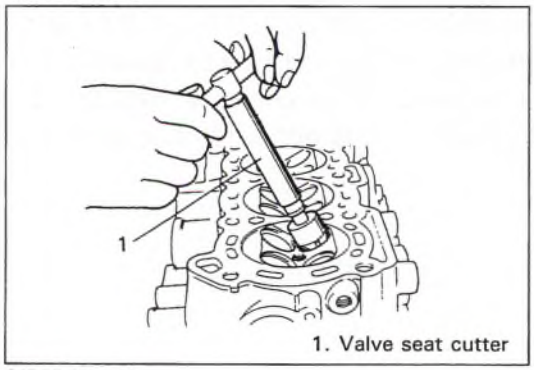
64B40-6A-40-1



1. Valve seat

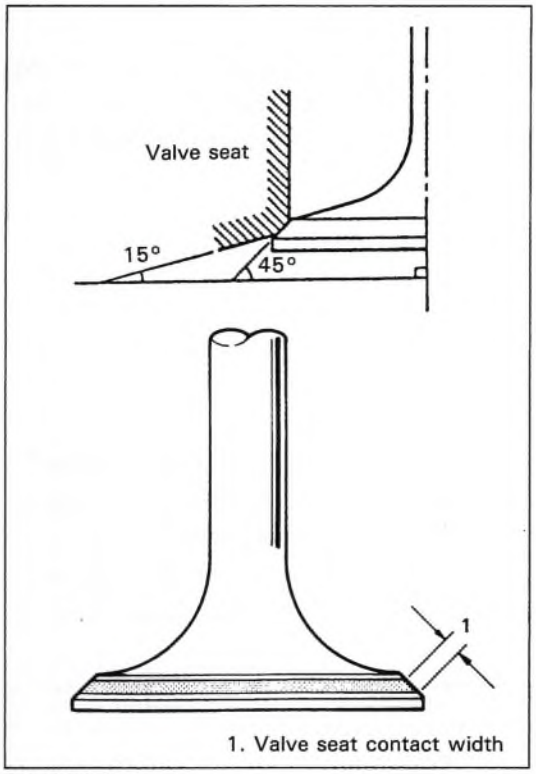
Valve seats for both intake and exhaust valves are machined to two different angles. Seat contact surface is cut 45° and area above contact surface (closest to combustion chamber) is cut to 15°.

64B40-6A-40-2



1. Valve seat cutter

1) Using 45° valve seat cutter, descale and clean up seat with one or two turns.



1. Valve seat contact width

64B40-6A-40-4

2) Inspect seat by using previously described seat width measuring procedure. If seat is pitted or burned, additional seat conditioning with 45° cutter is required.

NOTE:
Cut only minimum amount necessary from seat to prevent possibility of valve stem becoming too close to cam.

If contact area is too wide, use 15° valve seat cutter to make it narrower.

If contact area is too narrow, use 45° valve seat cutter to widen it.

Standard seating width: 1.1—1.3 mm

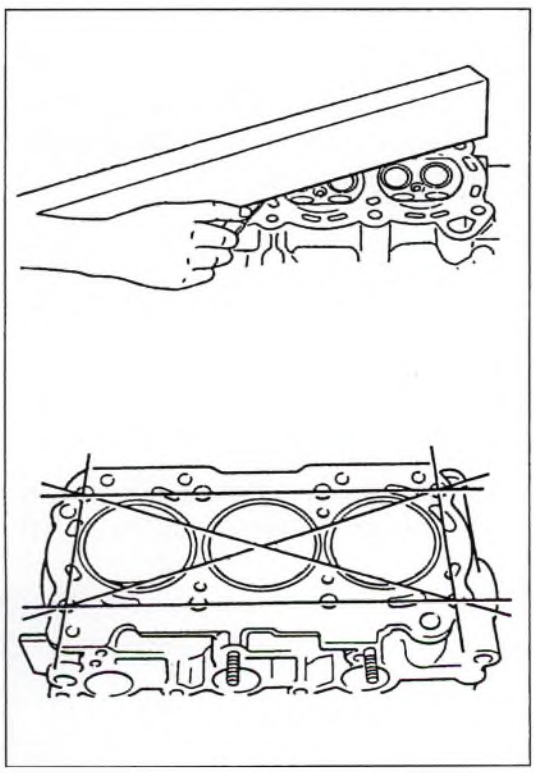
3) After desired seat width is obtained, lap valve on seat in two steps, first with a coarse size lapping compound applied to its face and secondly with a fine-size compound, each time using a valve lapper according to usual lapping method.

Cylinder Head

- Remove all carbon from combustion chambers.

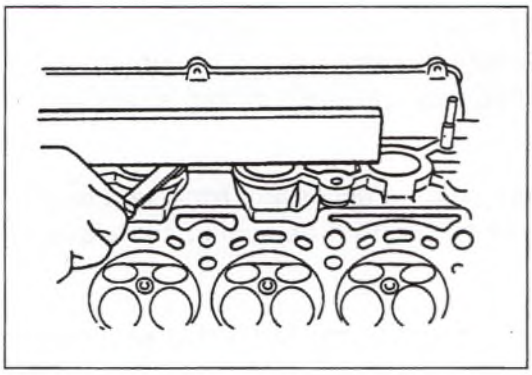
NOTE:
Do not use any sharp-edged tool to scrape off carbon. Be careful not to scuff or nick metal surfaces when decarboning. The same applies to valves and valve seats, too.

- Check cylinder head for cracks in intake and exhaust ports, combustion chambers, and head surface.



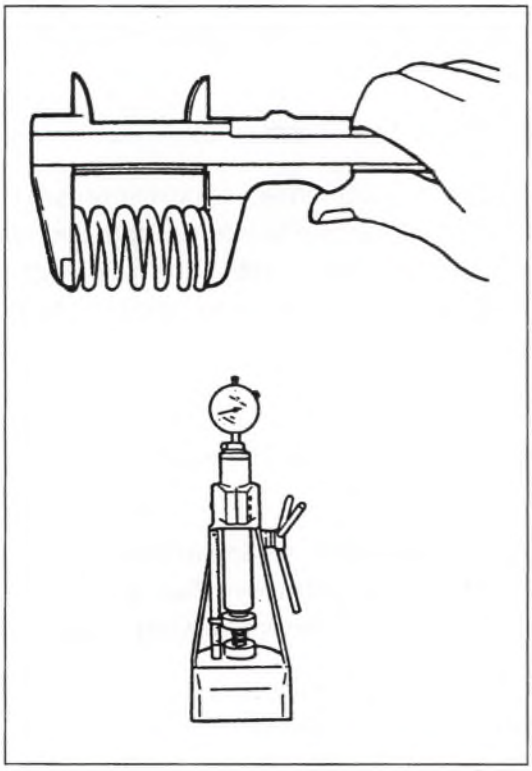
- Flatness of gasketed surface:
 Using a straightedge and thickness gauge, check surface at a total of 6 locations. If distortion limit, given below, is exceeded, correct gasketed surface with a surface plate and abrasive paper of about # 400 (Waterproof silicon carbide abrasive paper): place paper on and over surface plate, and rub gasketed surface against paper to grind off high spots.
 Should this fail to reduce thickness gauge readings to within the limit, replace cylinder head.
 Leakage of combustion gases from this gasketed joint is often due to a warped gasketed surface: such leakage results in reduced power output.

Limit of distortion: 0.05 mm



- Distortion fo manifold seating faces:
 Using a straightedge and thickness gauge, check seating faces of cylinder head for manifolds (IN & EX) so as to determine whether they should be corrected or cylinder head be replaced.

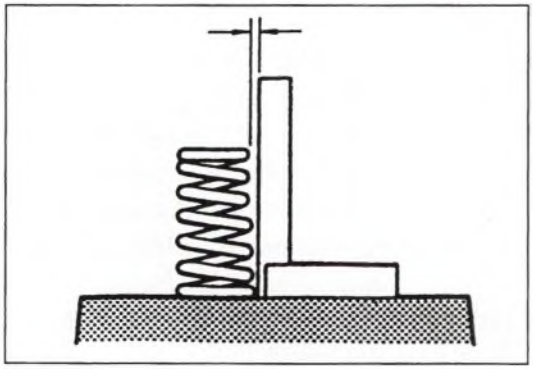
 Limit of distortion: 0.10 mm



Valve Springs

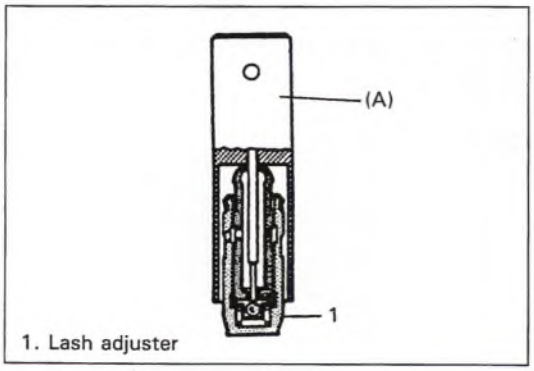
- Referring to data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

	Standard	Limit
Valve spring free length	46.9 mm	45.8 mm
Valve spring preload	19.8—22.8 kg at 37.5 mm	18.4 kg at 37.5 mm



- Spring squareness:
 Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve spring found to exhibit a larger clearance than limit must be replaced.

 Valve spring squareness
 Limit: 2.0 mm

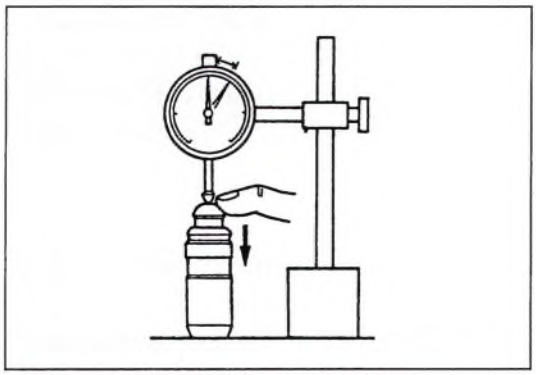


1. Lash adjuster

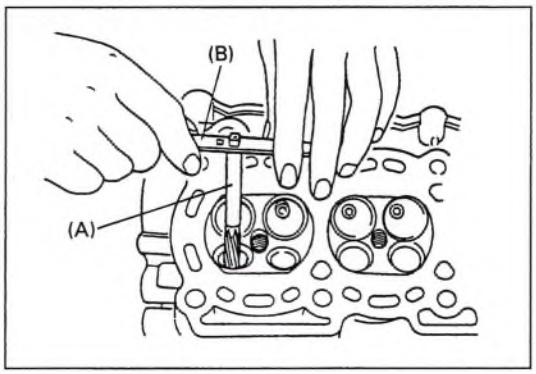
Valve Lash Adjuster

1) Immerse lash adjuster in kerosine.
2) Insert special tool into hole in tip end of plunger and with check ball pushed down, operate plunger up and down 10 to 20 times.

 Special Tool
 (A): 09919-36010



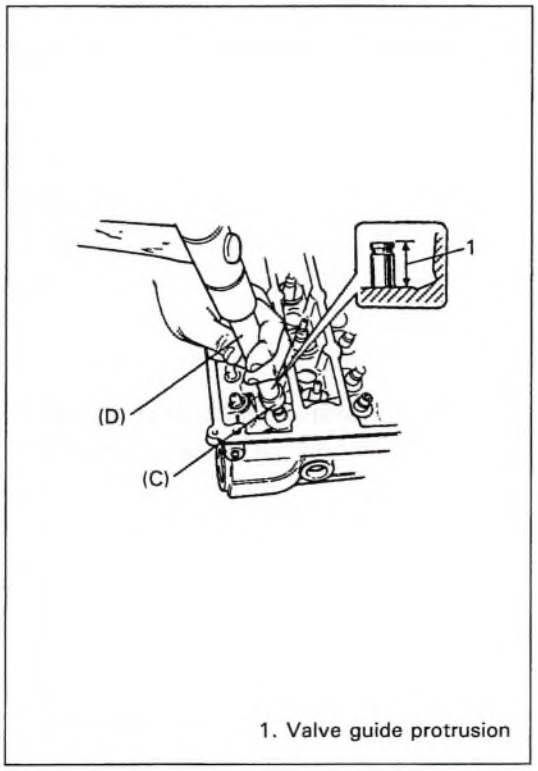
3) Push plunger with finger hard and if it moves about 0.2 mm or more, purge air again by using special tool. Check plunger for movement again and if it still moves 0.2 mm or more, replace lash adjuster.



ASSEMBLY

1) Before installing valve guide into cylinder head, ream guide hole with special tool (11 mm reamer) to remove burrs and make it truly round.

Special Tool
(A): 09916-38210
(B): 09916-34541



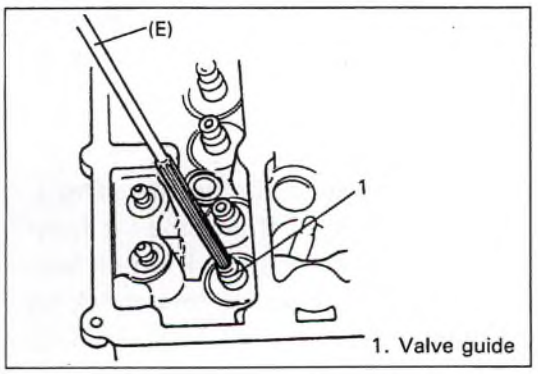
1. Valve guide protrusion

2) Heat cylinder head uniformly at a temperature of 80 to 100°C (176 to 212°F) so that head will not be distorted, and drive new valve guide into hole with special tools. Refer to figure.
Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
After installing, make sure that valve guide protrudes by 17 mm from cylinder head.

Special Tool
(C): 09917-88220
(D): 09916-58210

NOTE:
- **Do not reuse valve guide once disassembled. Install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

Valve guide oversize	0.03 mm
Valve guide protrusion (In and Ex)	17 mm

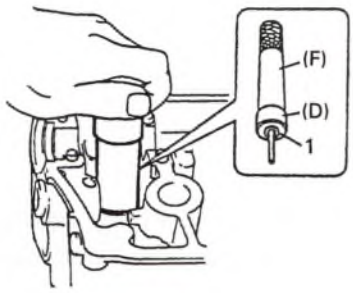


1. Valve guide

3) Ream valve guide bore with special tool (5.5 mm reamer). Be sure to clean it after reaming.

Special Tool
(E): 09916-34550 (5.5 mm reamer)
(B): 09916-34541

4) Install valve spring seat to cylinder head.



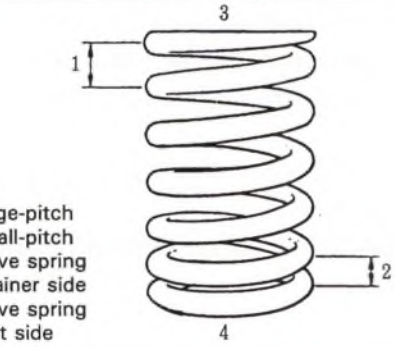
1. Valve stem seal

5) After applying engine oil to new valve stem seal and spindle of special tool (D), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand. After installing, check to be sure that seal is properly fixed to valve guide.

NOTE:

- **Do not reuse seal once disassembled. Be sure to install a new seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.**

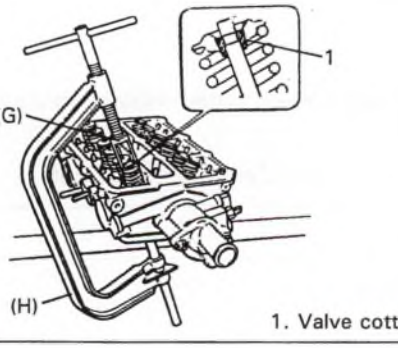
Special Tool
(D): 09916-58210
(F) : 09917-98220



1. Large-pitch
2. Small-pitch
3. Valve spring retainer side
4. Valve spring seat side

6) Install valve to valve guide.
Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.

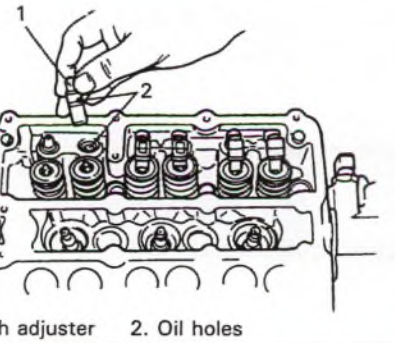
7) Install valve spring and spring retainer.
Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position spring in place so that its bottom end (small-pitch end) comes to the bottom (Valve spring seat side).



1. Valve cotters

8) Using special tool (Valve lifter), compress valve spring and fit two valve cotters into groove provided in the valve stem.

Special Tool
(G): 09916-14510
(H): 09916-48210
Forceps: 09916-84510

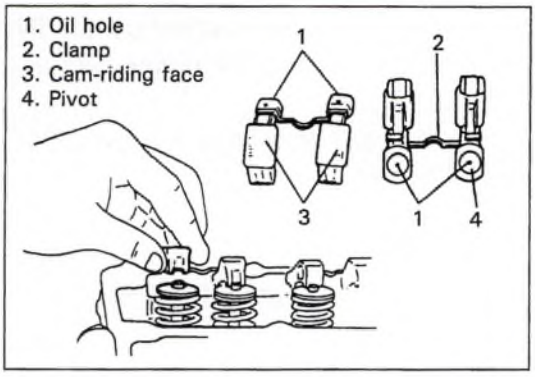


1. Lash adjuster 2. Oil holes

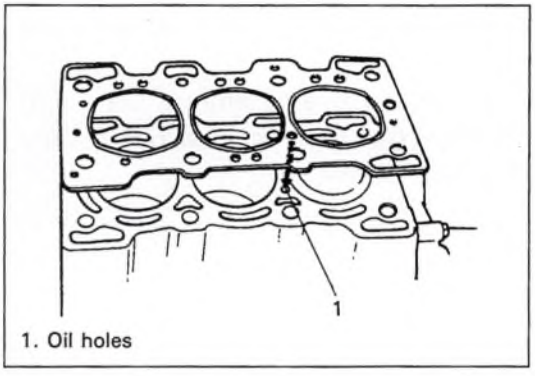
9) Apply engine oil around valve lash adjuster and then install it to cylinder head aligning adjuster oil hole with oil hole of cylinder head.

NOTE:

- **Make sure to bleed air in lash adjuster before installing it.**
- **Pour engine oil through oil hole of front side (at front dowel pin) and check that oil comes out from oil hole in rear side (at rear dowel pin). Perform this check on both intake and exhaust sides.**

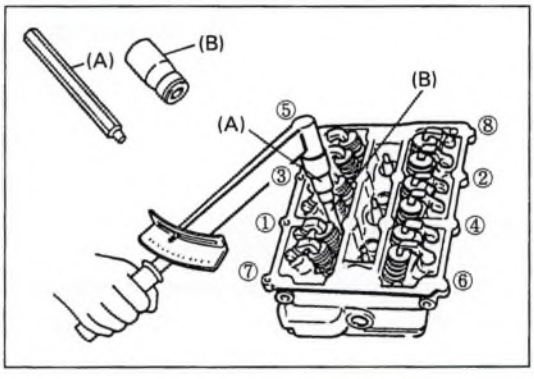


10) Install clamp to rocker arm.
11) Make sure that oil holes of rocker arm are free from any obstruction and apply engine oil to cam-riding face and pivot of rocker arm.
12) Install rocker arms on lash adjusters and valve stems respectively.



INSTALLATION

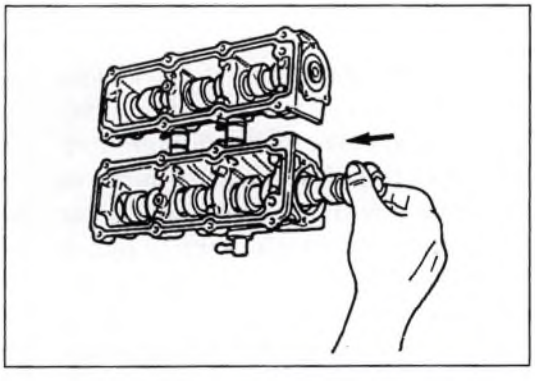
Reverse removal procedure noting following points.
1) Install new cylinder head gasket onto cylinder block aligning oil hole in gasket with oil hole in cylinder block.



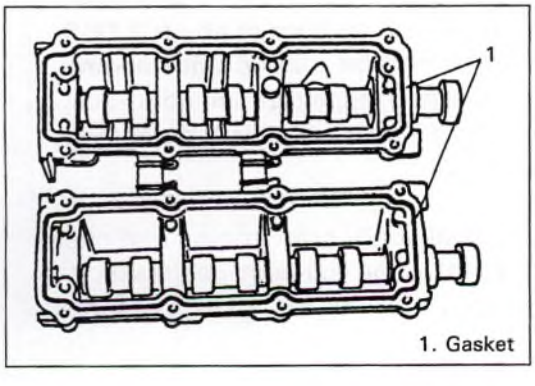
2) Install cylinder head.
After applying engine oil to cylinder head bolts, tighten them gradually with a torque wrench, following sequence given in figure. Finally tighten bolts to specified torque.

Tightening Torque
(a): 58—62 N·m (5.8—6.2 kg-m)

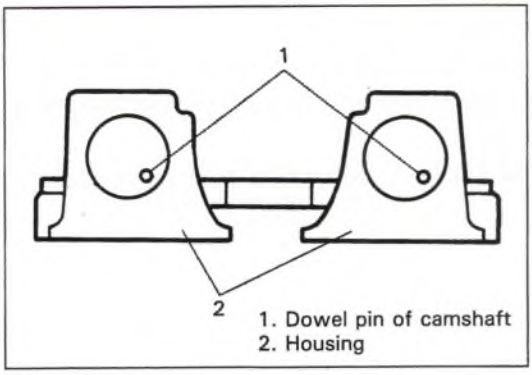
Special Tool
(A): 09900-00415
(B): 09900-00411



3) Apply engine oil to cams and journals on camshaft, and oil seal on camshaft housing.
4) Install camshafts (IN & EX) to camshaft housings from transmission side respectively.
5) Fix exhaust camshaft with thrust plalte and intake camshaft with distributor case. Use new gasket.

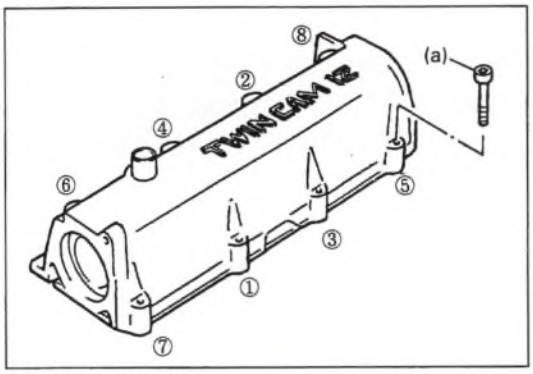


6) Clean mating surfaces of camshaft housing and cylinder head.
7) Check camshaft housing gasket for deterioration or damage, and replace as necessary.
Fit gasket into groove of housing securely.



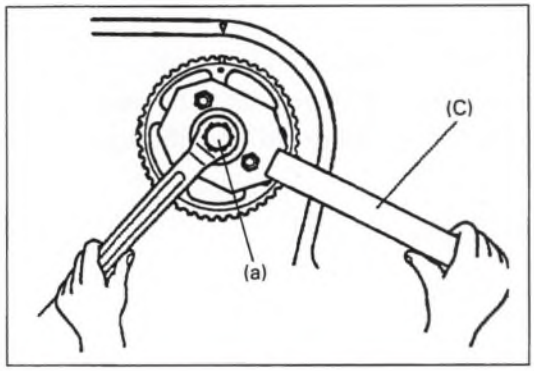
1. Dowel pin of camshaft
2. Housing

8) Before installing camshaft housing, set each camshaft (IN & EX) in position as shown in figure for timing belt installation.
Be careful not to slip gasket out of groove when installing housing to cylinder head.



9) Tighten bolts of camshaft housing by following sequence as indicated in figure.
Tighten a little at a time and evenly among bolts and repeat tightening sequence two to three times before they are tightened to specified torque.

Tightening Torque
(a): 8—12 N·m (0.8—1.2 kg-m)



10) Tighten camshaft timing pulley bolts (IN & EX) to specified torque respectively.

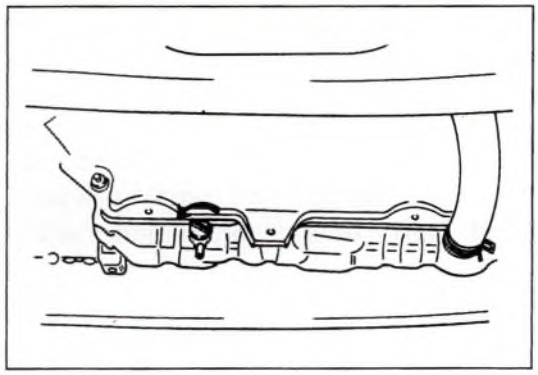
Special Tool
(C): 09917-68220

Tightening Torque
(a): 50—60 N·m (5.0—6.0 kg-m)

11) Install timing belt and outside covers as previously outlined.
12) Install distributor assembly, referring to SECTION 6F.
13) Refill cooling system, referring to SECTION 6B.

CAUTION:
- **Don't turn camshafts or start engine (i.e., valves should not be operated) for about half an hour after reinstalling hydraulic valve lash adjusters and camshafts. As it takes time for valves to settle in place, operating engine within half an hour after their installation may cause interference to occur between valves themselves or valves and piston.**
- **If air is trapped in valve lash adjuster, valve may make tapping sound when engine is operated after valve lash adjuster is installed. In such a case, run engine for about half an hour at about 2,000 r/min., and then air will be purged and tapping sound will cease. Should tapping sound not cease, it is possible that valve lash adjuster is defective. Replace it if defective.**

14) Upon completion of installation, start engine and check for oil leaks, coolant leaks and exhaust gas leaks.
15) Adjust ignition timing. Refer to SECTION 6F for adjustment.

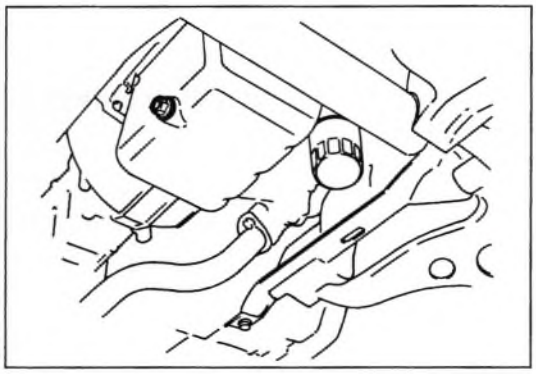


UNIT REPAIR OVERHAUL

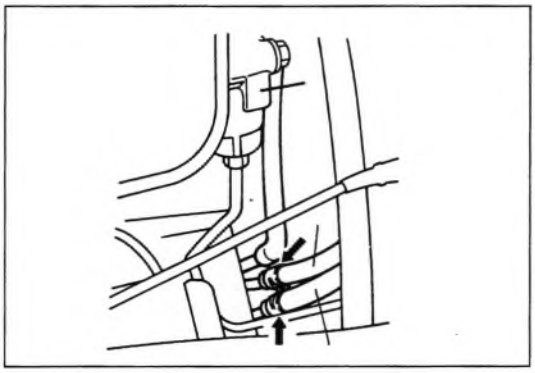
ENGINE ASSEMBLY

REMOVAL

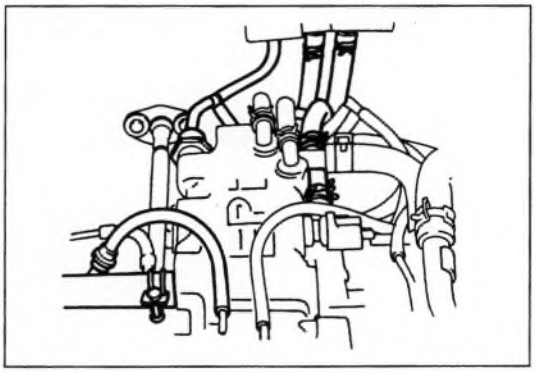
1) Relieve fuel pressure according to procedure described in FUEL PRESSURE RELIEF PROCEDURE of Section 6.
2) Remove battery and its tray.
3) Drain cooling system.



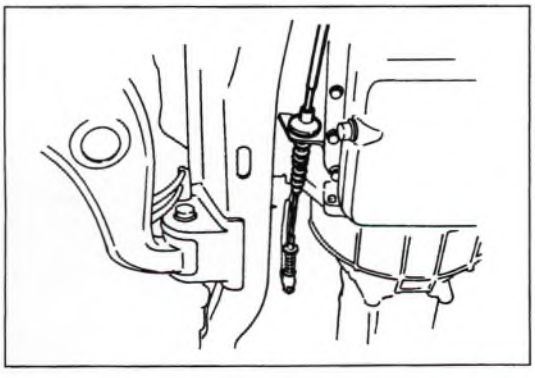
4) Drain engine oil and transmission oil.
5) Remove center console box and then gear shift lever boot.
6) Remove inter-cooler hoses.
7) Remove air cleaner assembly.



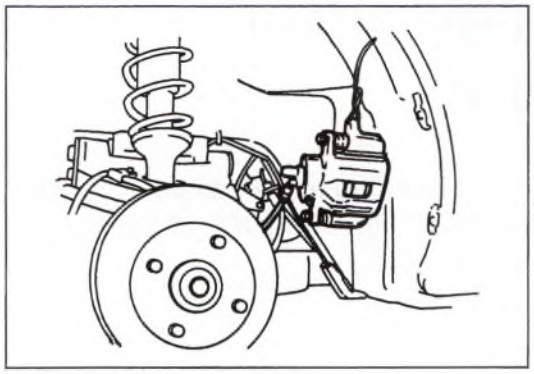
8) Disconnect fuel feed hose and return hose from pipes.
9) Disconnect coolant (water) hoses from throttle body and intake manifold.



10) Disconnect vacuum hoses from intake manifold.
11) Disconnect accelerator cable from throttle body.
12) Disconnect electric wires at their connectors respectively.

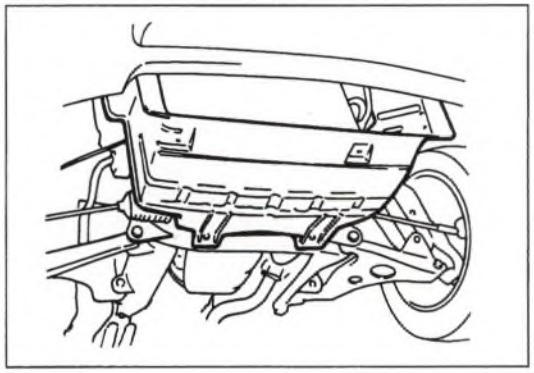


13) Remove engine front member and exhaust pipes.
14) Remove propeller shaft, referring to Section 4.
15) Remove rear shift lever case, referring to Section 7A.
16) Disconnect clutch release arm and clutch cable from transmission.

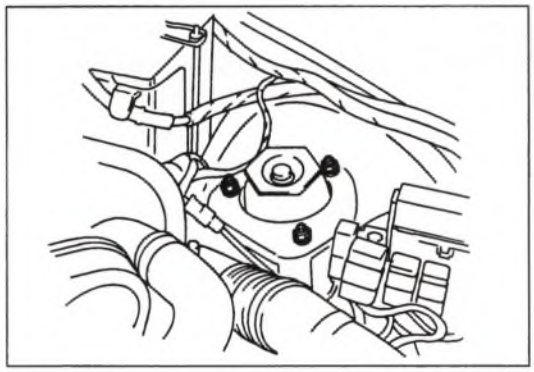


17) Remove front wheels (Right & Left).
18) Remove front brake calipers.

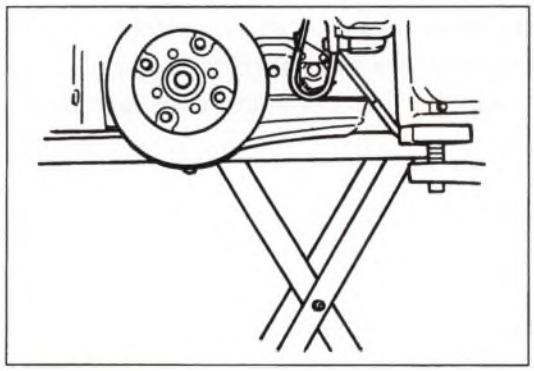
NOTE:
Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled. Don't operate brake pedal with caliper removed.



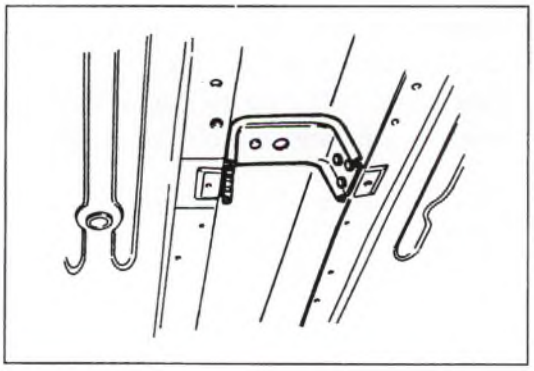
19) Remove front under cover from body.
20) Remove steering gear case mounting bolts.
21) Remove steering shaft joint bolt and detach gear case pinion from steering shaft joint.



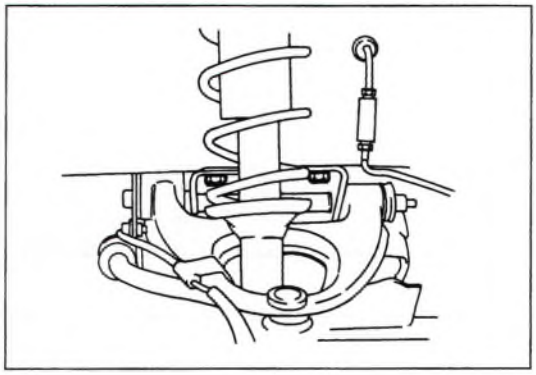
22) Remove front strut nuts (Right & Left).



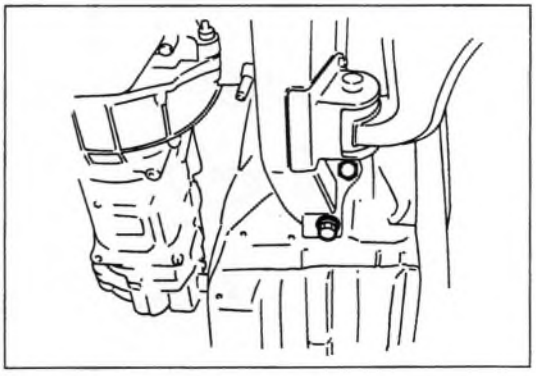
23) Support front suspension frame, engine and transmission with jack or the like.

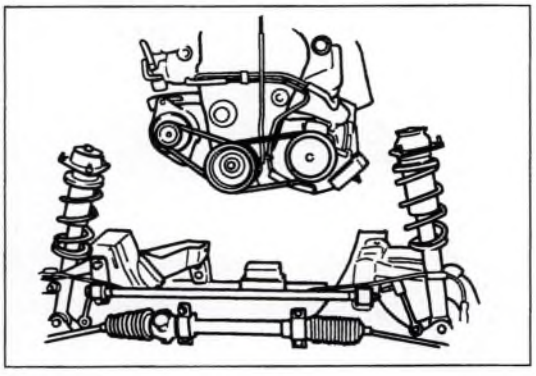


24) Remove transmission rear mounting bracket.

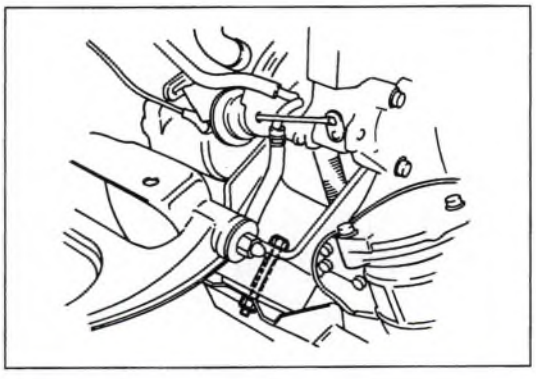


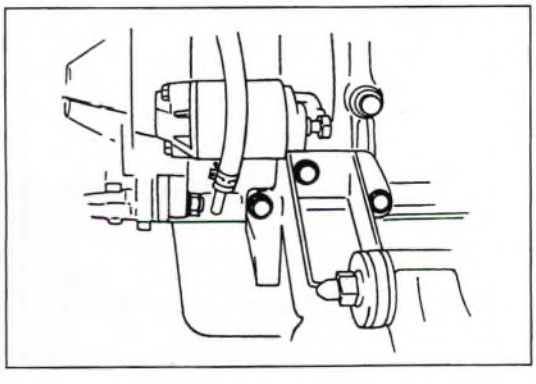
25) Remove front suspension frame bolts and remove engine, transmission and front suspension as a unit from body.





26) Separate transmission from engine and then engine from suspension frame.

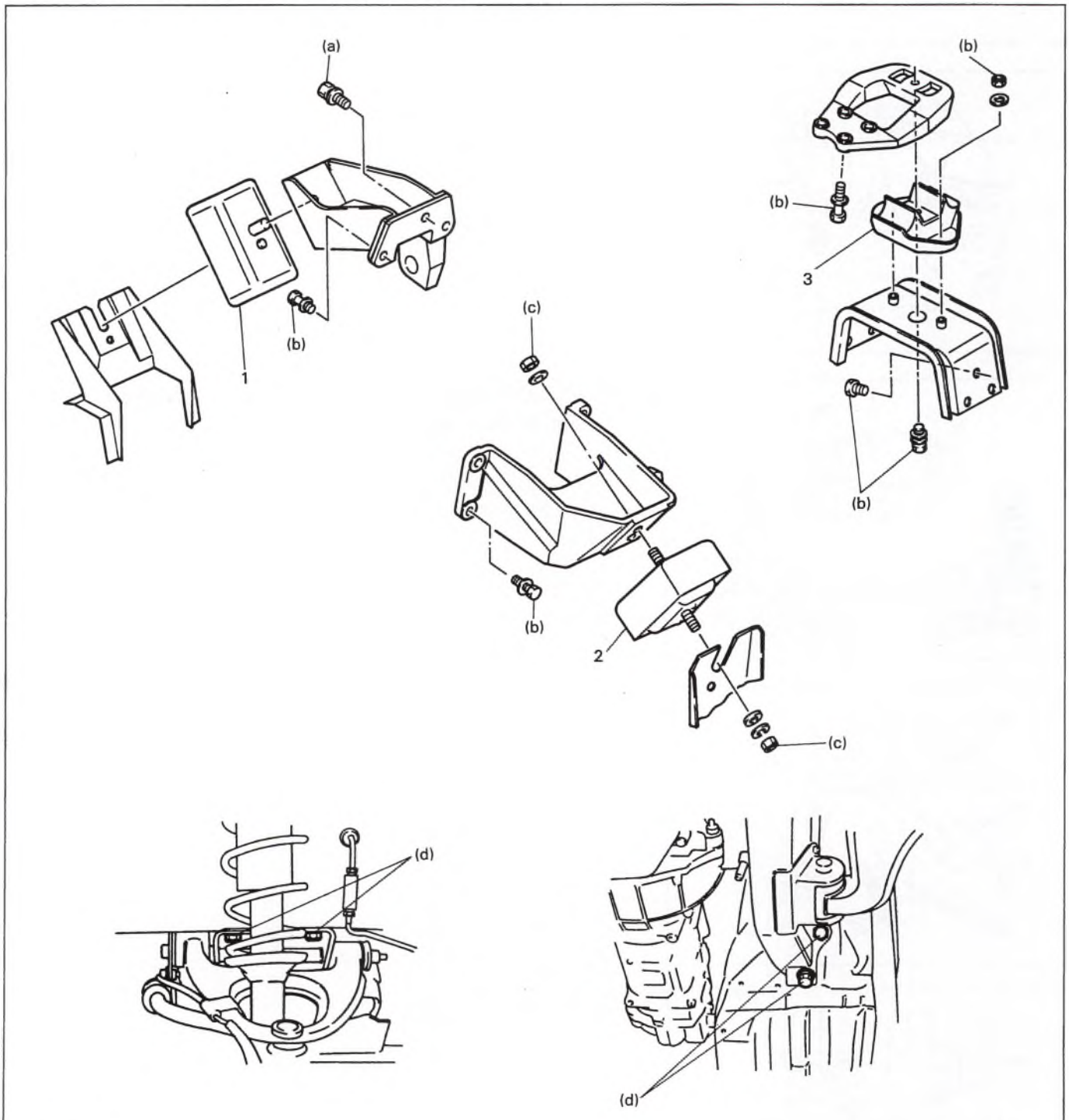




INSTALLATION

Reverse removal procedure for remounting.

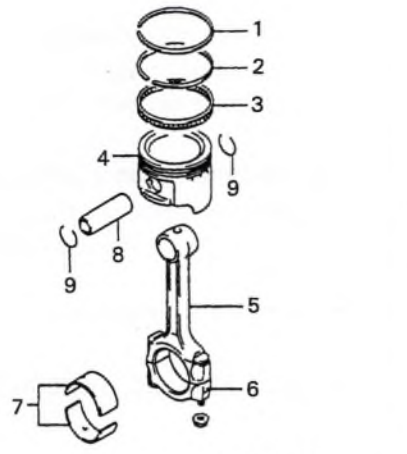
- Adjust clutch pedal free travel, referring to Section 7C.
- Refill transmission with gear oil, referring to Section 0B.
- Refill engine with engine oil, rerferring to Section 0B.
- Refill cooling system, referring to Section 6B.
- Upon completion of installation, verify that there is no fuel leakage, coolant leakage, transmission oil leakage or exhaust gas leakage at each connection.



Tightening Torque

(a): 30—40 N·m (3.0—4.0 kg-m)	(c): 40—50 N·m (4.0—5.0 kg-m)
(b): 18—28 N·m (1.8—2.8 kg-m)	(d): 50—70 N·m (5.0—7.0 kg-m)

1. Engine front mounting (R)
2. Engine front mounting (L)
3. Engine rear mounting

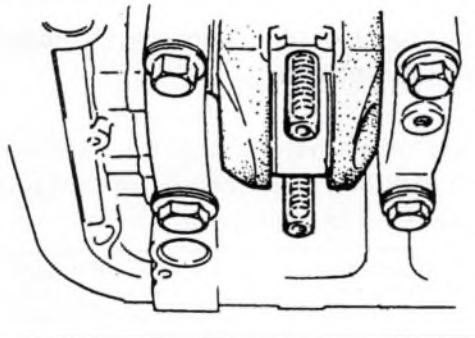


1. Top ring
2. 2nd ring
3. Oil ring
4. Piston
5. Connecting rod
6. Bearing cap
7. Bearing
8. Piston pin
9. Circlip

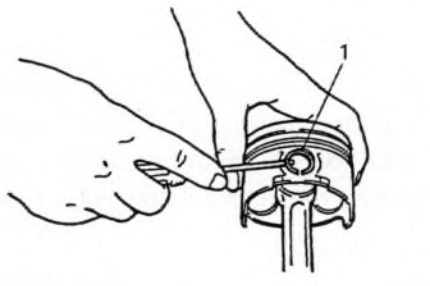
PISTONS, PISTON RINGS, CONNECTING RODS AND CYLINDERS

REMOVAL

1) Dismount engine assembly from body as previously outlined.
2) Remove cylinder head from cylinder block.
3) Remove oil pan and oil pump strainer.
4) Mark cylinder number on all pistons, connecting rods and rod bearing caps, using silver pencil or quick drying paint.
5) Remove connecting rod bearing caps.



6) Install guide hose over threads of rod bolts.
 This is to prevent damage to bearing journal and rod bolt threads when removing connecting rod.
7) Decarbon top of cylinder bore.
8) Push piston and connecting rod assembly out thorugh the top of cylinder bore.



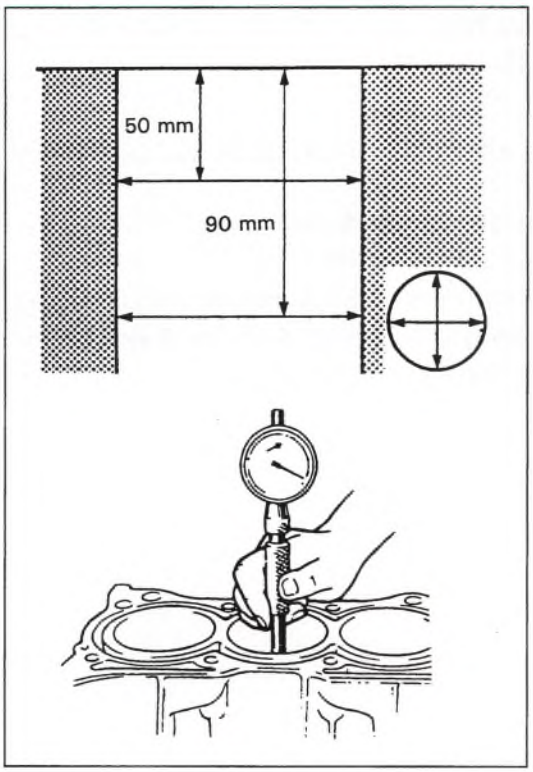
1. Piston pin circlip

DISASSEMBLY

1) Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
2) Remove piston pin from connecting rod.
 • Ease out piston pin circlips, as shown.

CLEANING

Clean carbon from piston head and ring grooves, using a suitable tool.



INSPECTION

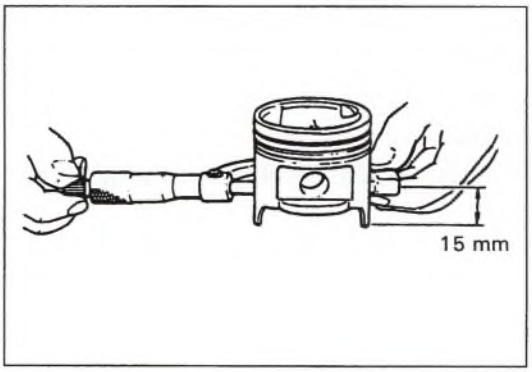
Cylinders

- Inspect cylinder walls for scratches, roughness, or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use oversize piston.
- Using a cylinder gauge, measure cylinder bore in thrust and axial directions at two positions as shown in figure.
 If any of following conditions is noted, rebore cylinder.
 1. Cylinder bore dia. exceeds limit.
 2. Difference of measurements at two positions exceeds taper limit.
 3. Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore dia. limit: 65.07 mm

Taper and out-of-round limit: 0.10 mm

NOTE:
If any one of three cylinders has to be rebored, rebore all three to the same next oversize. This is necessary for the sake of uniformity and balance.



Pistons

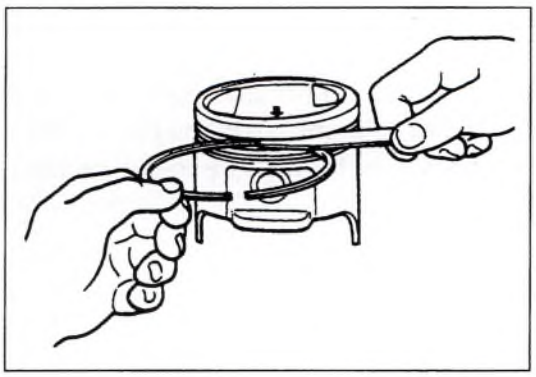
- Inspect piston for faults, cranks or other damage. Damaged or faulty piston should be replaced.
- Piston diameter:
 As indicated in figure, piston diameter should be measured at the height of 15 mm (0.59 in) from the piston skirt end in the direction perpendicular to piston pin.

Piston diameter (mm)	Standard	64.965—64.985
	Oversize 0.25	65.215—65.235
	Oversize 0.50	65.465—65.485

- Piston clearance:
 Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as given below. If it is out of specification, rebore cylinder and use oversize piston.

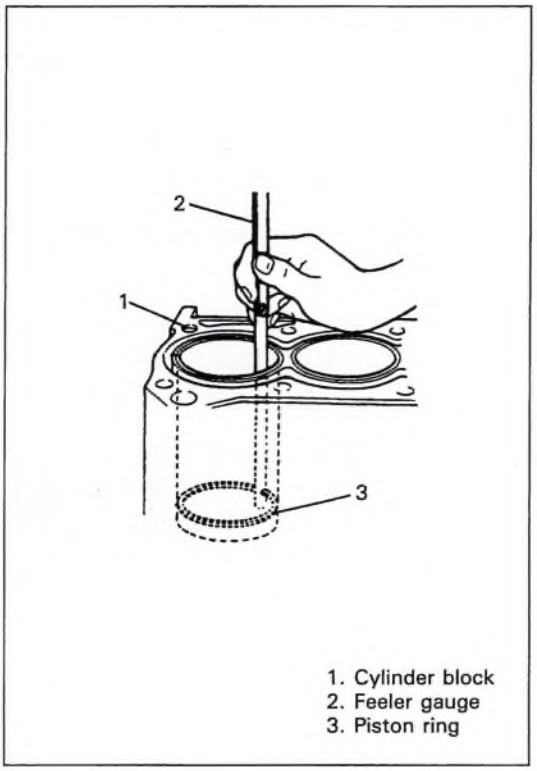
Piston clearance: 0.025—0.055 mm

NOTE:
Cylinder bore diameters measured in thrust direction at two positions should be used for calculation of piston clearance.



- Ring groove clearance:
 Before checking, piston grooves must be clean, dry and free of carbon.
 Fit new piston ring into piston groove, and measure clearance between ring and ring land by using thickness guage.
 If clearance is out of specification, replace piston.

		Standrad	Limit
Ring groove clearance (mm)	Top ring	0.03—0.07	0.12
	2nd ring	0.02—0.06	0.10



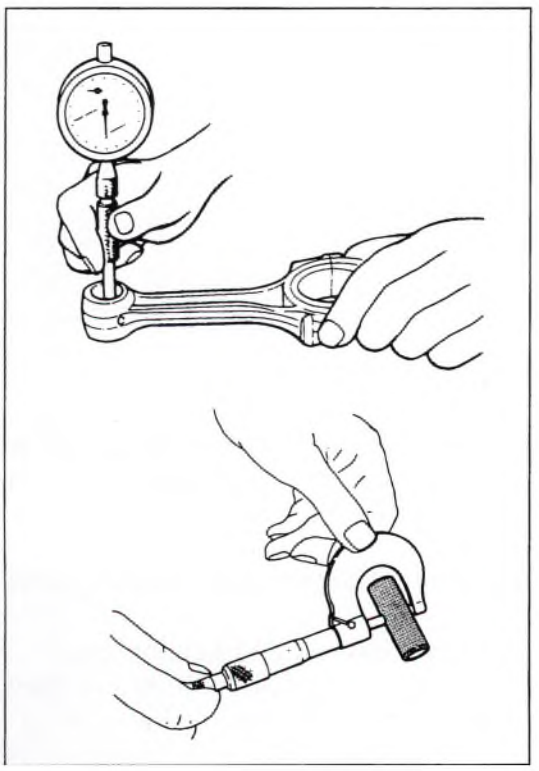
1. Cylinder block
2. Feeler gauge
3. Piston ring

Piston Rings

To measure end gap, insert piston ring into cylinder bore bottom as shown in figure and then measure gap by using thickness gauge.
If measured gap is out of specification, replace ring.

NOTE:
Decarbon and clean the top of cylinder bore before inserting piston ring.

		Standard	Limit
Piston ring end gap (mm)	Top ring	0.12—0.27	0.7
	2nd ring	0.20—0.35	0.7
	Oil ring	0.20—0.70	1.8

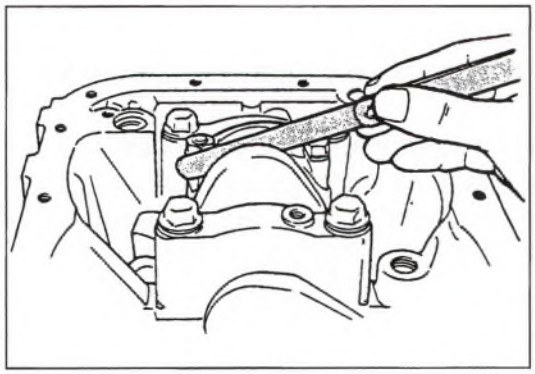


Piston Pin

- Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod or piston.
- Piston pin clearance:
 Check the piston pin clearance in the small end. Replace the connecting rod if its small end is badly worn or damaged or if the clearance checked exceeds the limit.

Pin clearance in small end
Standard: 0.006—0.019 mm
Limit : 0.05 mm

Small-end bore: 18.006—18.014 mm
Piston pin dia : 17.995—18.000 mm



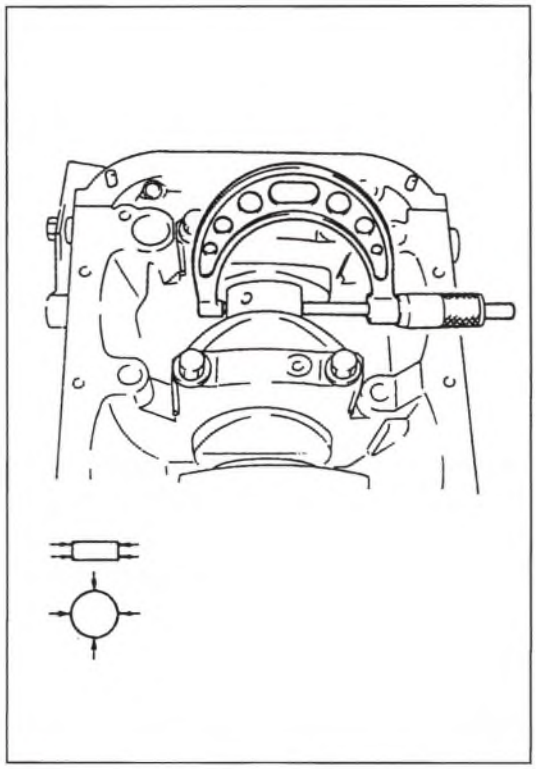
Connecting Rod

- Big-end side clearance:
 Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

 Big-end side clearance
 Standard: 0.10—0.20 mm
 Limit : 0.35 mm

- Connecting rod alignment:
 Mount connecting rod on aligner to check it for bow and twist and, if limit is exceeded, replace it.

Limit on bow	0.05 mm
Limit on twist	0.10 mm

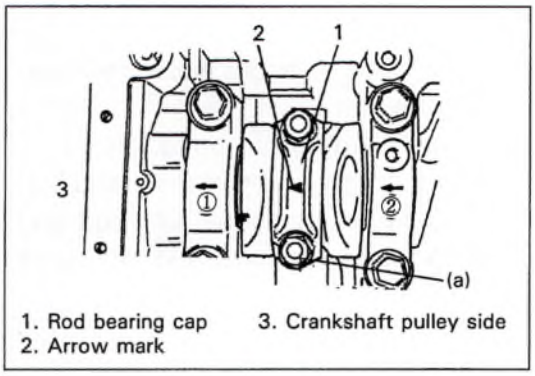


Crank Pin and Connecting Rod Bearings

- Inspect crank pin for uneven wear or damage.
 Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged, or out-of-round or taper is out of limit, replace crankshaft.

 Crank pin diameter: 37.982—38.000 mm
 Out-of-round and taper limit : 0.01 mm

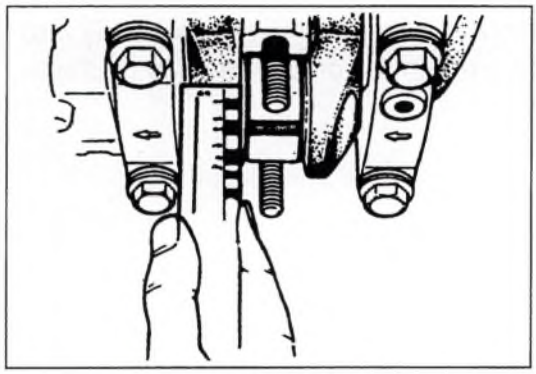
- Rod bearing:
 Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.
- Rod bearing clearance:
 1) Before checking bearing clearance, clean bearing and crank pin.
 2) Install bearing in connecting rod and bearing cap.
 3) Place a piece of gaging plastic to full width of crankpin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



1. Rod bearing cap
2. Arrow mark
3. Crankshaft pulley side

4) Install rod bearing cap to connecting rod.
When installing cap, be sure to point the arrow mark on cap to crankshaft pulley side, as shown in figure. After applying engine oil to rod bolts, tighten cap nuts to specified torque. DO NOT turn crankshaft with gaging plastic installed.

Tightening Torque
(a): 31—35 N·m (3.1—3.5 kg-m)



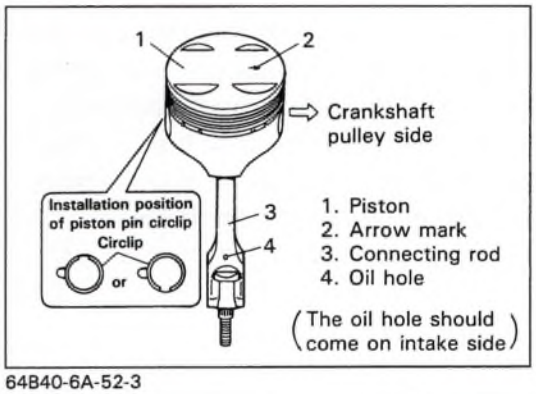
5) Remove cap and using a scale on gaging plastic envelope, measure gaging plastic width at the widest point (clearance).
If clearance is out of specification, use a new bearing and remeasure clearance.

Bearing clearance
Standard: 0.020—0.064 mm

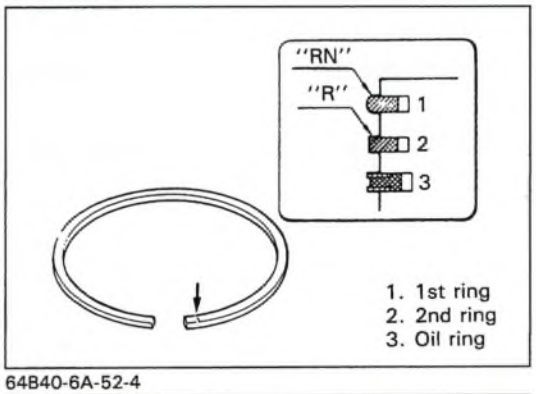
6) If clearance can not be brought to within specification even by using a new bearing, replace crankshaft.

PISTON ASSEMBLY

1) After applying engine oil to piston pin and piston pin holes in piston and connecting rod, fit connecting rod to piston as indicated in figure and insert piston pin to piston and connecting rod, and install piston pin circlip.

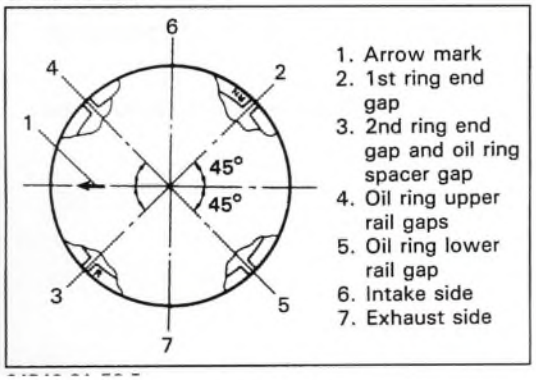


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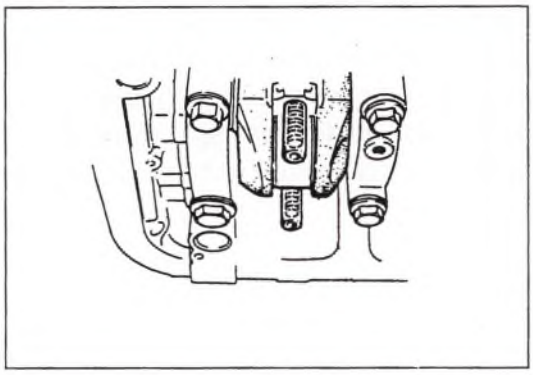


64B40-6A-52-4

2) Install piston rings to piston.
- As indicated in figure, 1st and 2nd rings have "RN" and "R" mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
- 1st ring differs from 2nd ring in shape.
 Distinguish 1st ring from 2nd ring referring to figure.
- When installing oil ring, install spacer first and then two rails.

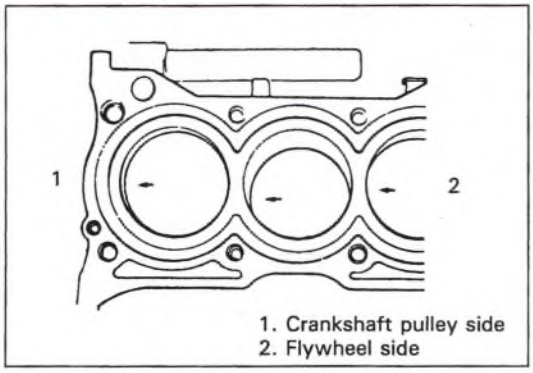


3) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as indicated in figure.



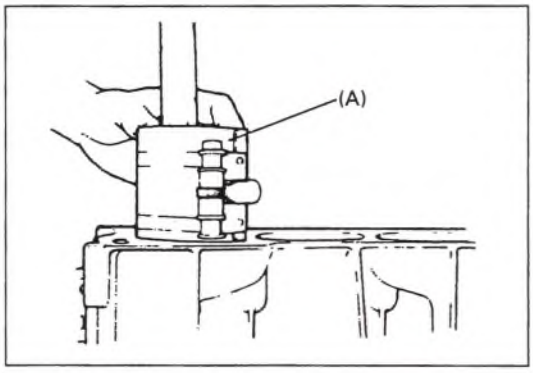
INSTALLATION

1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.
2) Install guide hoses over connecting rod bolts.
 These guide hoses protect crankpin and threads of rod bolt from damage during installation of connecting rod and piston assembly. Refer to figure for installation of guide hoses.



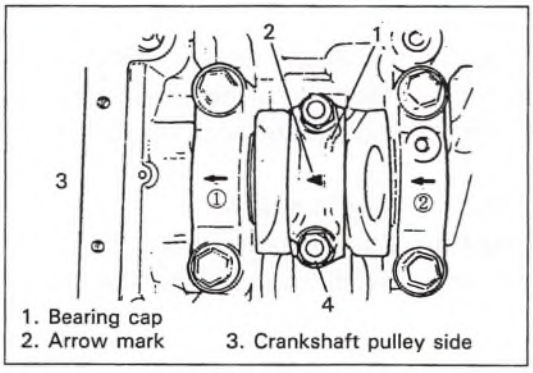
1. Crankshaft pulley side
2. Flywheel side

3) When installing piston and connecting rod assembly into cylinder bore, direct arrow mark on piston head to crankshaft pulley side.



4) Install piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft. Using a hammer handle, tap piston head to install piston into bore. Hold ring compessor firmly against cylinder block until all piston rings have entered cylinder bore.

Special Tool
(A): 09916-77310



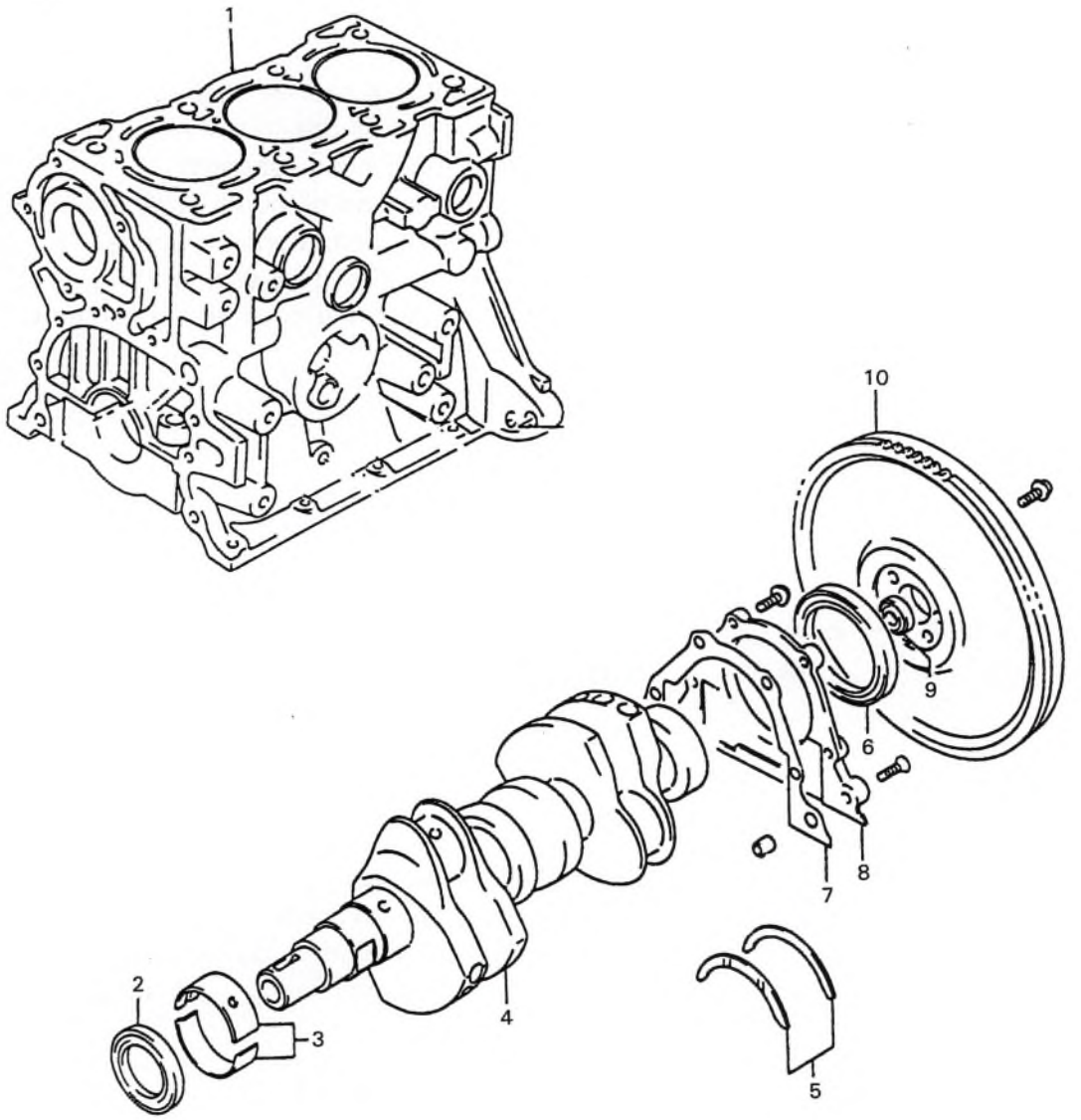
1. Bearing cap
2. Arrow mark
3. Crankshaft pulley side

5) Remove guide hoses and install bearing cap.
 When installing cap to rod, point arrow mark on cap to crankshaft pulley side.
 After applying engine oil to bolt threads, tighten cap nuts to specification.

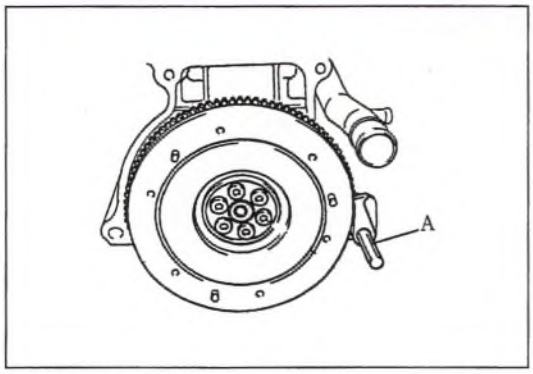
Tightening Torque
(a): 31—35 N·m (3.1—3.5 kg-m)

6) Reverse removal procedure for installation of remainder, as previously outlined.
7) Install engine assembly to vehicle as previously outlined.

MAIN BEARINGS, CRANKSHAFT AND CYLINDER BLOCK



1. Cylinder block
2. Front oil seal
3. Main bearing
4. Crankshaft
5. Thrust bearing
6. Rear oil seal
7. Oil seal housing gasket
8. Oil seal housing
9. Input shaft bearing
10. Flywheel

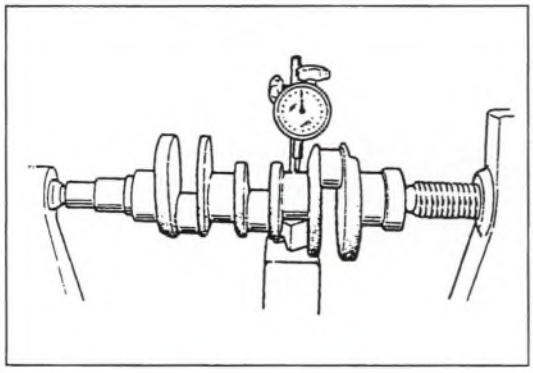


REMOVAL

1) Remove engine assembly from body as previously outlined.
2) Remove clutch and flywheel from engine.

Special Tool
(A): 09924-17810

3) Remove crankshaft pulley, timing belt, crankshaft timing belt pulleys, etc as previously outlined.
4) Remove cylinder head assembly.
5) Remove oil pan and oil pump strainer.
6) Remove pistons and connecting rods.
7) Remove oil pump and oil seal housing.
8) Remove main bearing caps and crankshaft.



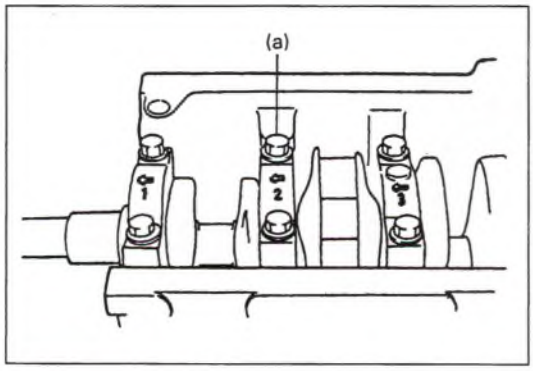
INSPECTION

Crankshaft

Crankshaft runout

Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

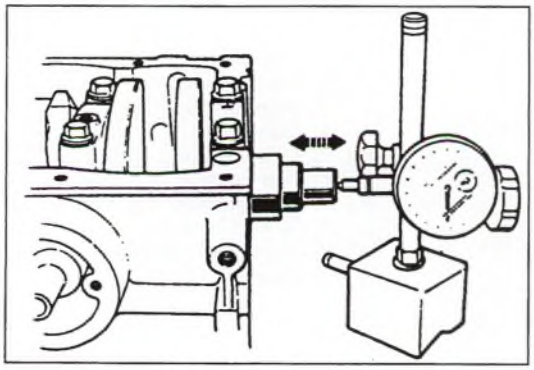
Limit on runout: 0.06 mm



Crankshaft thrust play

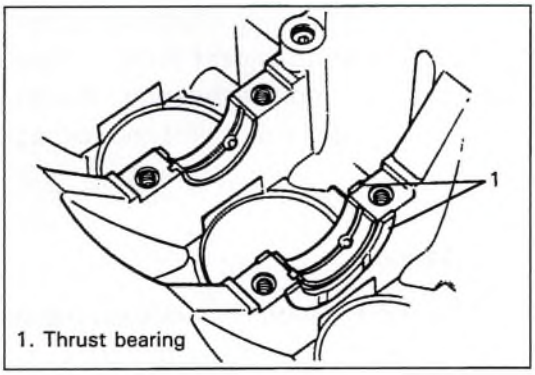
Measure this play with crankshaft set in cylinder block in normal manner, that is, with thrust bearing and journal bearing caps installed. Tighten bearing cap bolts to specified torque.

Tightening Torque
(a): 55—60 N·m (5.5—6.0 kg-m)



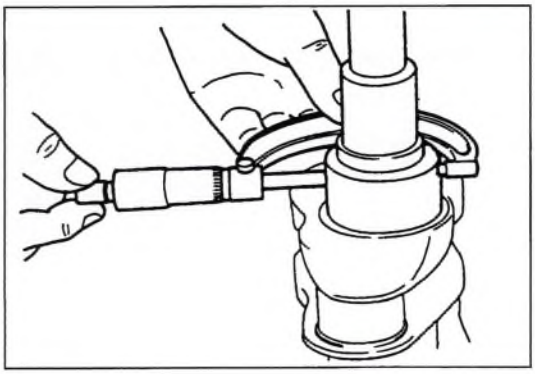
Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.
If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Crankshaft Thrust Play
Standard: 0.11—0.31 mm
Limit : 0.35 mm



1. Thrust bearing

Thickness of crankshaft thrust bearing	Standard	2.500 mm
	Oversize: 0.125 mm	2.563 mm



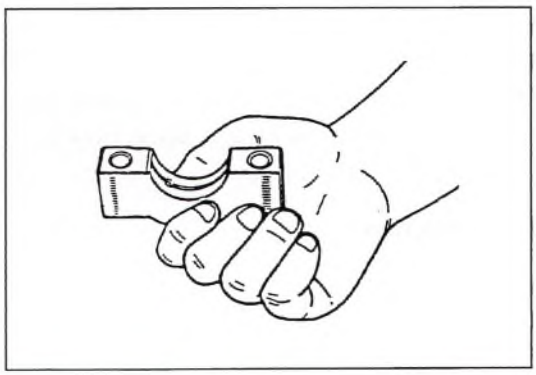
Out-of-round and taper (uneven wear) of journals

An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings. If any one of journals is badly damaged or if amount of uneven wear in the sense explained above exceeds its limit, regrind or replace crankshaft.

Crankshaft Main Bearings

Inspection

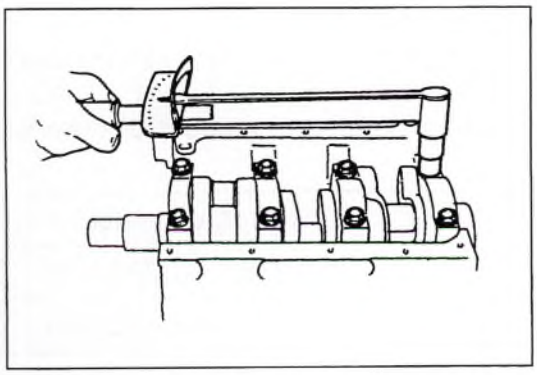
Check bearings for pitting, scratches, wear or damage.
If any malcondition is found, replace both upper and lower halves. Never replace one half without replacing the other half.



Main bearing clearance

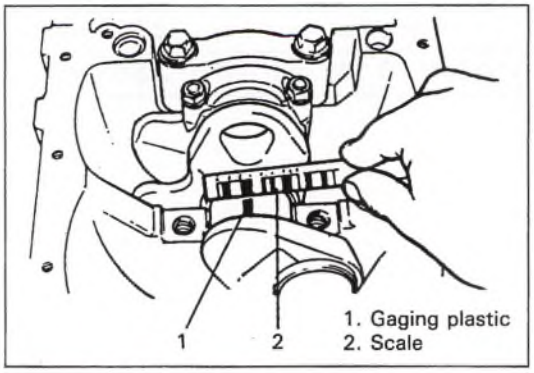
Check clearance by using gaging plastic according to following procedure.

1) Remove bearing caps.
2) Clean bearings and main journals.
3) Place a piece of gaging plastic to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



4) Install bearing cap as previously outlined and evenly torque cap bolts to specified torque. Bearing cap MUST be torqued to specification in order to assure proper reading of clearance.

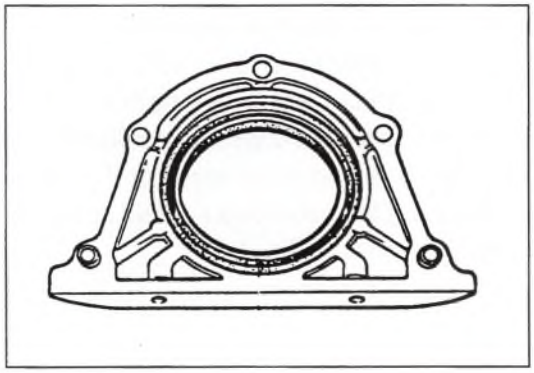
NOTE:
Do not rotate crankshaft while gaging plastic is installed.



5) Remove cap, and using scale on gaging plastic envelope, measure gaging plastic width at its widest point. If clearance is out of specifications, replace bearing. Always replace both upper and lower inserts as a unit and recheck clearance.

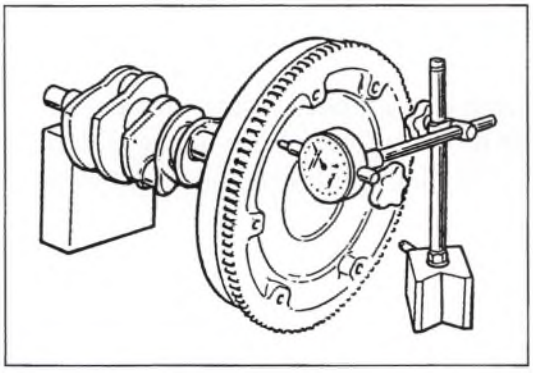
Bearing Clearance
Standard: 0.020—0.064 mm

If clearance can not be brought to within specification even by using a new bearing, replace crankshaft.



Rear Oil Seal

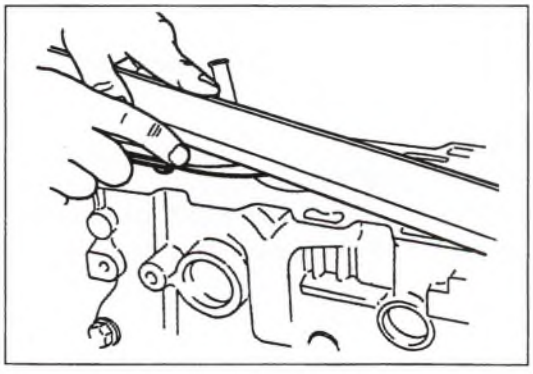
Carefully inspect oil seal for wear or damage. If lip portion is worn or damaged, replace oil seal.



Flywheel

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.
- Check flywheel for face runout with a dial gauge. If runout exceeds its limit, replace flywheel.

Limit on runout: 0.2 mm



Cylinder Block

Distortion of gasketed surface

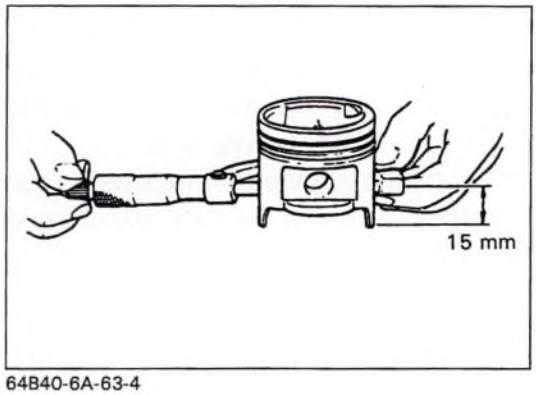
- Using a straightedge and a thickness gauge, check gasketed surface for distortion at 6 locations specified and, if flatness exceeds its limit, correct it.

Cylinder flatness limit: 0.05 mm

Honing or reboring cylinders

1) When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2) Select oversized piston according to amount of cylinder wear.

Size	Piston diameter
Oversize 0.25 mm	65.215—65.235 mm
Oversize 0.50 mm	65.465—65.485 mm



64B40-6A-63-4

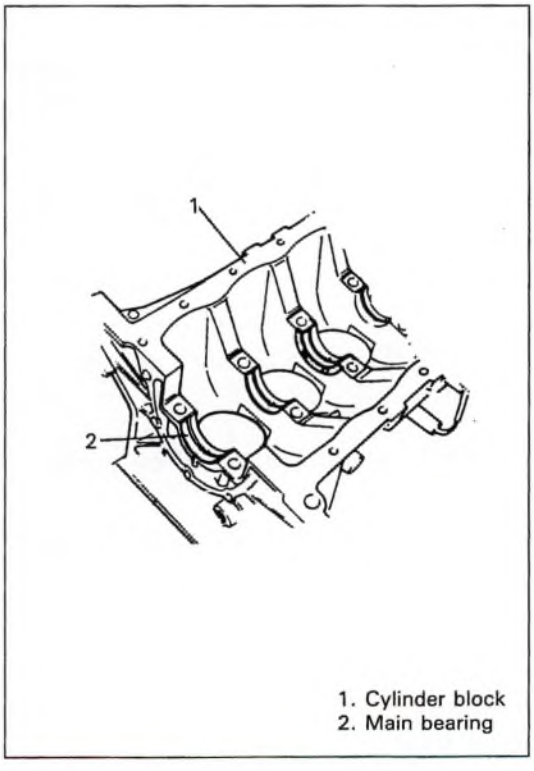
3) Using micrometer, measure the piston diameter.
4) Calculate cylinder bore diameter to be rebored.

D = A + B − C
D: Cylinder bore diameter to be rebored.
A: Piston diameter as measured.
B: Piston clearance = 0.025—0.045 mm
C: Allowance for honing = 0.02 mm

5) Rebore and hone cylinder to calculated dimension.

NOTE:
Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

6) Measure piston clearance after honing.

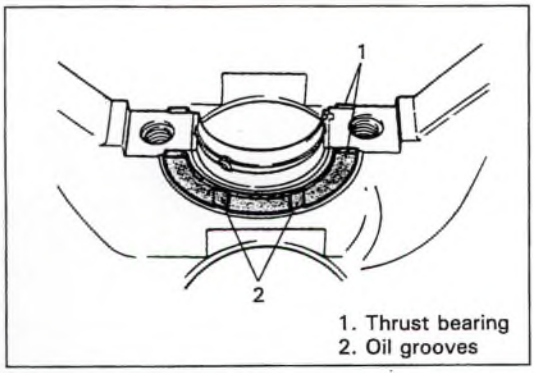


1. Cylinder block
2. Main bearing

INSTALLATION

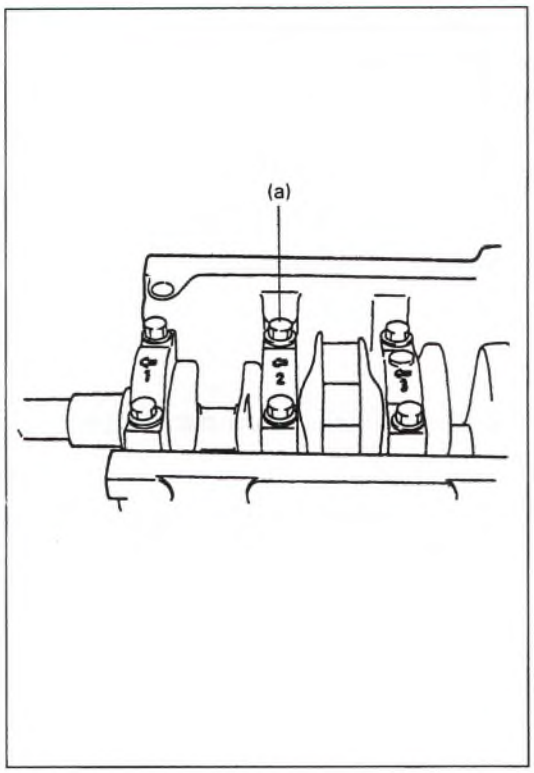
NOTE:
- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.**

1) Fit main bearings to cylinder block and bearing caps.



1. Thrust bearing
2. Oil grooves

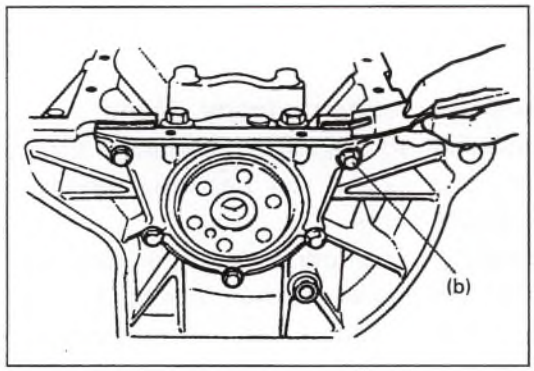
2) Fit thrust bearings to cylinder block between No.2 and No. 3 cylinders. Face oil groove sides to crank webs.



3) Put crankshaft on cylinder block.
4) Fit bearing caps sequentially in ascending order, 1, 2, 3 and 4, starting from pulley side. Be sure to point arrow mark (on each cap) to crankshaft pulley side.
Gradual and uniform tightening is important for bearing cap bolts. Make sure that four caps become tight equally and progressively till specified torque is attained.

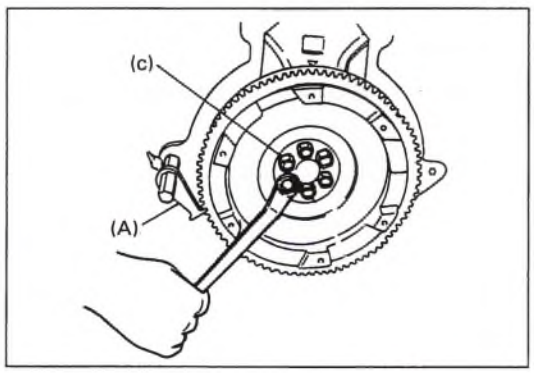
Tightening Torque
(a): 55—60 N·m (5.5—6.0 kg-m)

NOTE:
After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned by hand.



5) Install oil seal housing and its gasket.
Install new gasket. Do not reuse gasket removed in disassembly. Oil lip portion of oil seal before installing. Tighten housing bolts to specification.
After installing oil seal housing, gasket edges might bulge out; if so, cut them off to make them flush with cylinder block and oil seal housing.

Tightening Torque
(b): 9—12 N·m (0.9—1.2 kg-m)



6) Install oil pump.
Refer to item "Oil pump" for installation of oil pump.
7) Install flywheel.
Using special tool, lock flywheel and torque its bolts to specification.

Special Tool
(A): 09924-17810

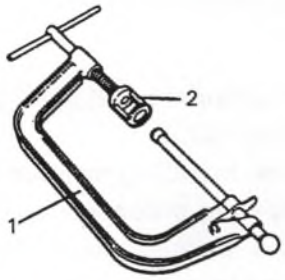
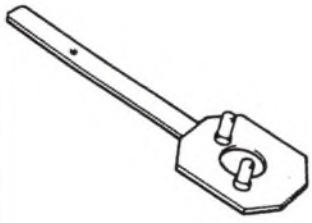
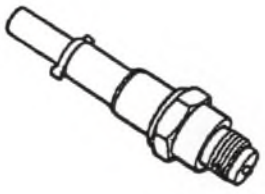
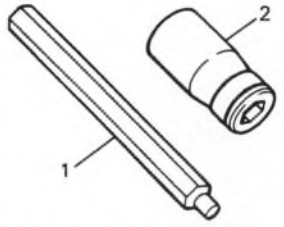
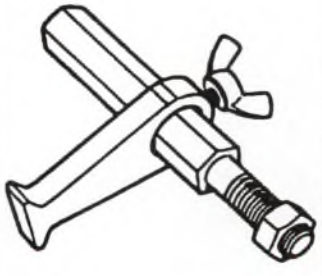
Tightening Torque
(c): 40—45 N·m (4.0—4.5 kg-m)

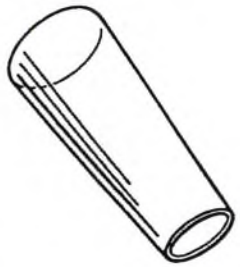
8) Install pistons and connecting rods as previously outlined.
9) Install oil pump strainer and oil pan.
10) Install cylinder head assembly to cylinder block.

NOTE:
Tighten cylinder head bolts to specified torque as previously outlined.
Whenever installing cylinder head to new cylinder block, use following procedure to tighten cylinder head bolts.
- **Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes "zero". And then torque them to specification again.**

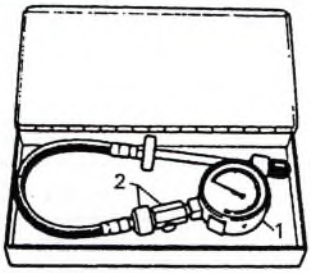
11) Install crankshaft timing belt pulley, timing belt, crankshaft pulley, etc., as previously outlined.
12) Install clutch to flywheel. For clutch installation, refer to Section 7C.
13) Install engine assembly to vehicle as previously outlined.

SPECIAL TOOLS

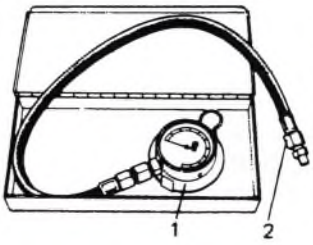
 09915-47340 Oil filter wrench	 1. 09916-14510 Valve lifter 2. 09916-48210 Attachment	 09916-44910 Valve guide remover	 09917-88220 Valve guide installer attachment
 09916-58210 Valve guide installer handle	 09916-34550 Reamer (5.5 mm)	 09916-38210 Reamer (11 mm)	 09916-34541 Reamer handle
 09917-68220 Camshaft pulley holder	 09915-64550 Compression gauge attachment	 09916-84510 Forceps	 1. 09900-00415 8 mm Hexagon wrench bit 2. 09900-00411 Hexagon wrench socket
 09915-64530 Compression gauge hose	 09924-17810 Flywheel holder	 09916-77310 Piston ring compressor	 09918-08210 Vacuum gauge hose joint



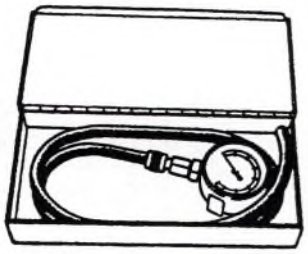
09926-18210
Oil seal guide (Vinyl resin)



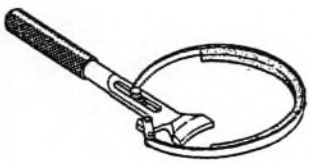
09915-64510
Compression gauge set
1. 09915-64510-001
 Gauge
2. 09915-64510-002
 Connector



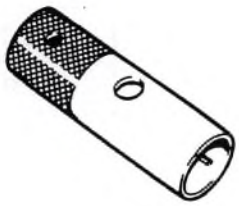
1. 09915-77310
 Oil pressure gauge
2. 09915-78211
 Oil pressure gauge
 attachment



09915-67310
Vacuum gauge



09927-56020
Crankshaft pulley holder



09919-36010
Lash adjuster air bleeding
tool



09917-98220
Valve stem seal installer

REQUIRED SERVICE MATERIALS

RECOMMENDED SUZUKI PRODUCT	USE
Sealant 1207C (99000-31150)	Mating surfaces or cylinder block and oil pan.

RECOMMENDED TORQUE SPECIFICATIONS

System	Fastening part	Tightening torque	
		N·m	kg-m
Engine	Cylinder head bolt	58—62	5.8—6.2
	Spark plug	10—20	1.0—2.0
	Intake manifold nut	8—12	0.8—1.2
	Throttle body bolt	12—18	1.2—1.8
	Turbocharger mount bolt	40—60	4.0—6.0
	Camshaft housing bolt	8—12	0.8—1.2
	Exhaust manifold bolt & nut	18—28	1.8—2.8
	Camshaft timing belt pulley bolt	50—60	5.0—6.0
	Timing belt cover bolt and nut	9—12	0.9—1.2
	Crankshaft pulley bolt	65—75	6.5—7.5
	Connecting rod bearing cap nut	31—35	3.1—3.5
	Crankshaft main bearing cap bolt	55—60	5.5—6.0
	Flywheel bolt	40—45	4.0—4.5
	Oil pressure switch	12—15	1.2—1.5
	Oil pan bolt and nut	9—12	0.9—1.2
	Oil drain plug	30—40	3.0—4.0
	Oil pump case bolt	9—12	0.9—1.2
	Timing belt tensioner bolt	15—23	1.5—2.3
	Engine mounting & bracket bolt and nut	Refer to page 6A-36.	

SECTION 6B

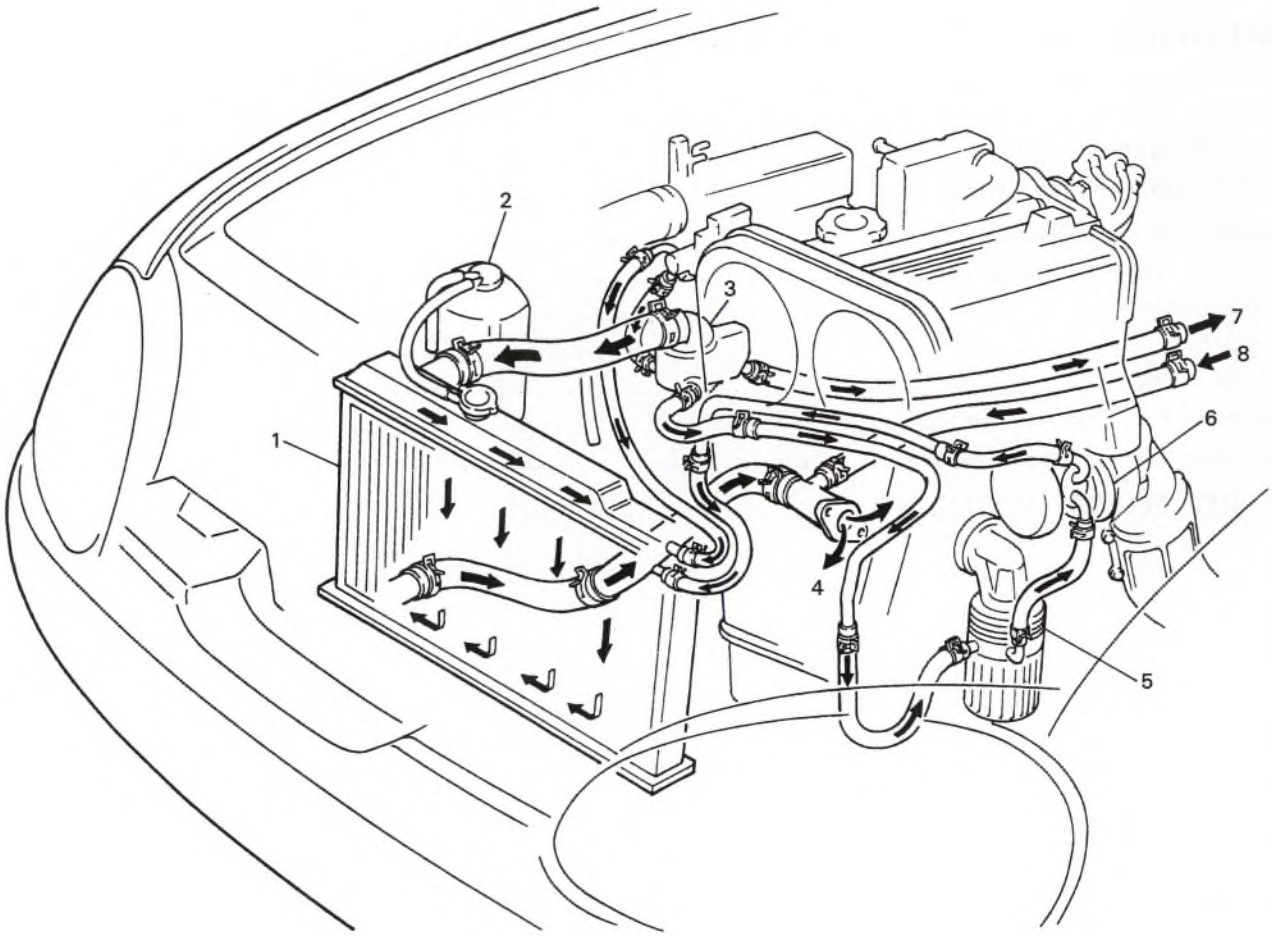
ENGINE COOLING

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GENERAL DESCRIPTION

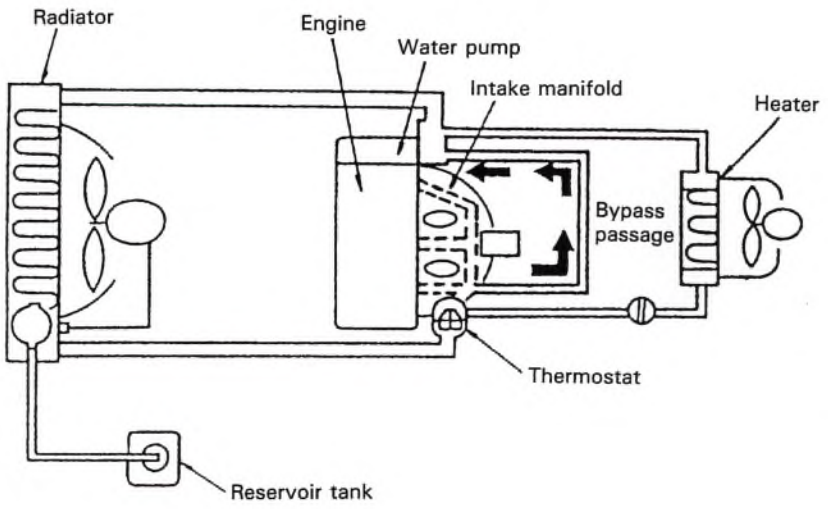
The cooling system consists of the radiator cap, radiator, water reservoir tank, hoses, water pump, cooling fan, thermostat. The radiator is of tube-and-corrugated fin type.



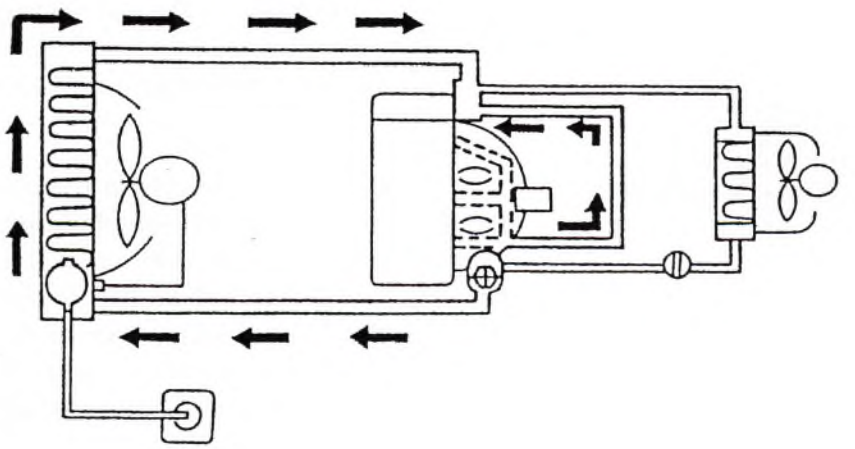
1. Radiator
2. Reservoir tank
3. Water thermostat
4. To cylinder block
5. Oil cooler
6. Turbocharger
7. To heater core
8. From heater core

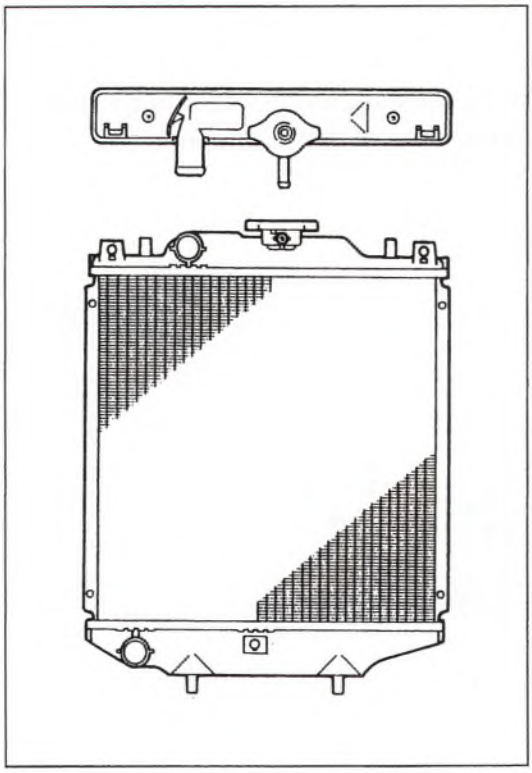
COOLING SYSTEM CIRCULATION

- Circuit When Engine Coolant Temperature is below 82°C.
 When temperature of the engine coolant is low, the thermostat is closed completely and therefore, coolant flow from the engine, through inlet manifold and bypass hose to the water pump.



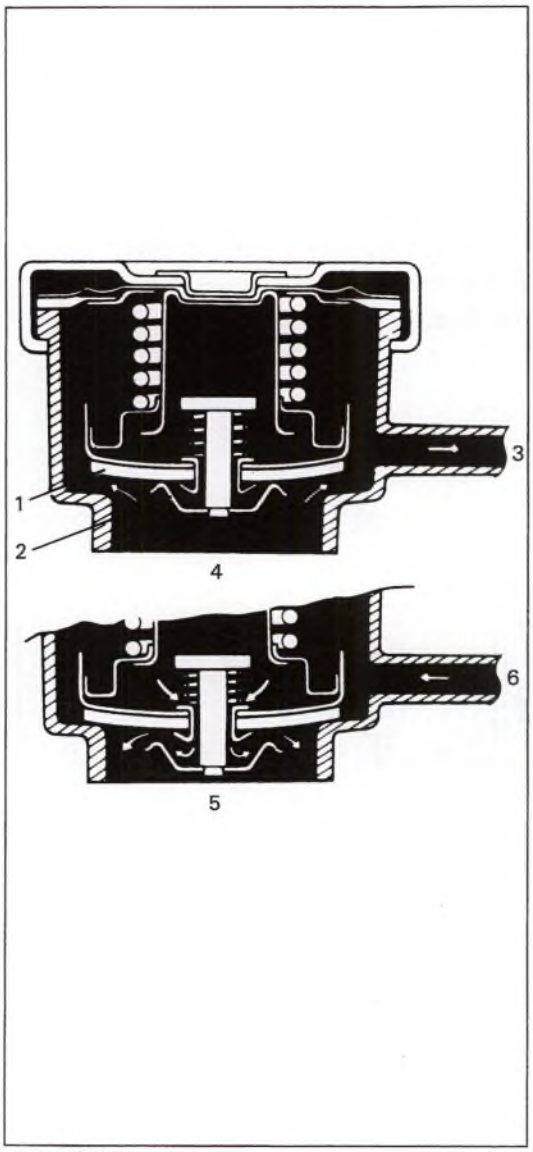
- Circuit When Engine Coolant Temperature is above 82°C.
 The water thermostat starts opening at 82°C and opens fully at 95°C. During this time, engine coolant flows through the bypass hose to the water pump and at the same time, through the thermostat, radiator inlet hose, radiator and radiator outlet to the water pump as well.
 The amount of engine coolant flowing into radiator varies according to opening of the water thermostat.





RADIATOR

Radiator is of tube-and-corrugated fin type.



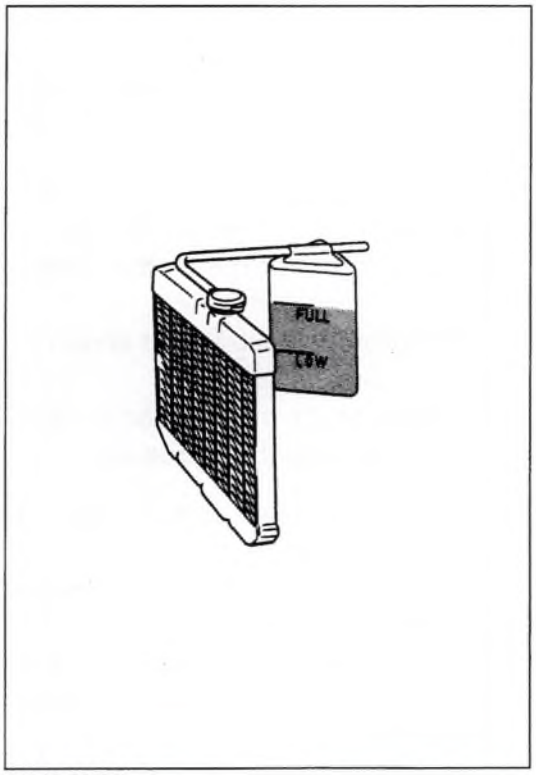
64R40-6B-2.1

RADIATOR CAP

A pressure-vent cap is used on the radiator. The cap contains a pressure valve and vacuum valve.
The pressure valve is held against its seat by a spring of predetermined strength which protects the cooling system by relieving the pressure if the pressure in cooling system rises by 90 kPa (0.9 kg/cm²). The vacuum valve is held against its seat by a light spring which permits opening of the valve to relieve vacuum created in the system when it cools off and which otherwise might cause the radiator to collapse.

NOTE:
Do not remove radiator cap to check engine coolant level; check coolant visually at the see-through coolant reservoir tank.
Coolant should be added only to reservoir tank as necessary.

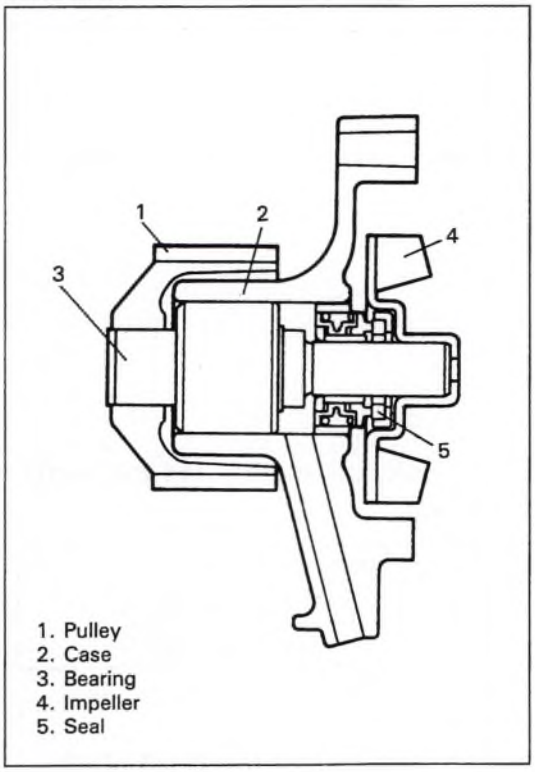
WARNING:
As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility or causing a serious fire.



64B40-6B-3-4

COOLANT RESERVOIR TANK

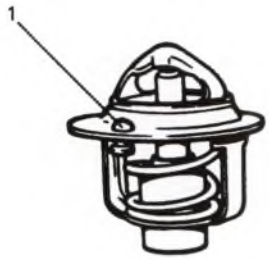
A ''see-through'' plastic reservoir tank is connected to the radiator by a hose. As the car is driven, the coolant is heated and expands. The portion of the coolant displaced by this expansion flows from the radiator into the reservoir tank.
When the car is stopped and the coolant cools and contracts, the displaced coolant is drawn back into the radiator by vacuum.
Thus, the radiator is kept filled with coolant to the desired level at all times, resulting in increased cooling efficiency.
Coolalnt level should be between ''FULL'' and ''LOW'' marks on the reservoir tank.
Coolant should be added only to the reservoir tank as necessary.



1. Pulley
2. Case
3. Bearing
4. Impeller
5. Seal

WATER PUMP

The centrifugal type water pump is used in the cooling system. The pump impeller is supported by a totally sealed bearing. The water pump can not be disassembled.



1. Air bleed valve

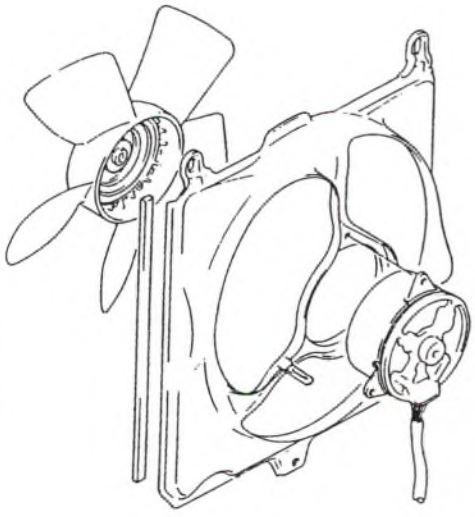
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THERMOSTAT

A wax pellet type thermostat is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm up and to regulate coolant temperatures.
A wax pellet element is hermetically contained in a metal case, and expands when heated and contracts when cooled.
When the pellet is heated and expands, the metal case pushes down the valve to open it.
As the pellet is cooled, the contraction allows the spring to close the valve.
Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.

At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.
As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator.
In the top portion of the thermostat, an air bleed valve is provided; this valve is for venting out the gas or air, if any, that is accumulated in the circuit.

Thermostat functional sepc. ± 1.5°C	
Temp. at which valve begins to open	82°C
Temp. at which valve become fully open	95°C



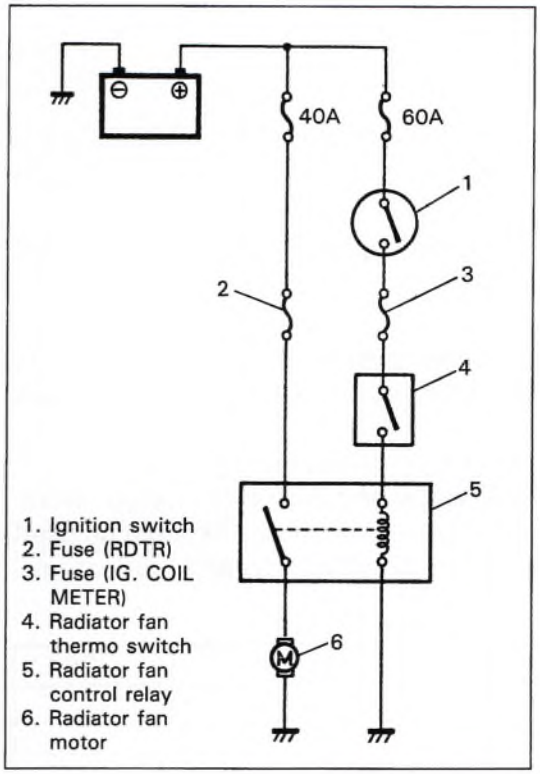
COOLING FAN

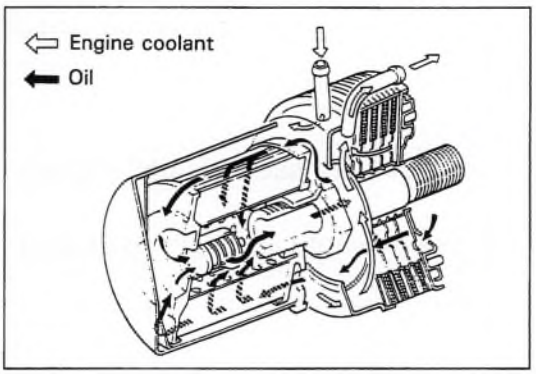
The cooling fan is driven by electric motor, and the motor is activated by thermo switch.

Fan thermo switch functional spec.	
Temp. at switch "ON"	More than 93°C
Temp. at switch "OFF"	Less than 88°C

WARNING:
Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the thermo switch with the ignition switch in the "ON" position.

ELECTRIC CIRCUIT





OIL COOLER

The oil cooler is installed to cylinder block of oil filter attached part. And the engine oil is cooled by engine coolant.

DIAGNOSIS

Condition	Possible Cause	Correction
Engine overheats	• Not enough coolant	Check coolant level and add as necessary.
	• Faulty thermostat	Replace.
	• Faulty water pump	Replace.
	• Dirty or bent radiator fins	Clean or remedy.
	• Coolant leakage on cooling system	Repair
	• Defective cooling fan motor or thermo switch	Check and replace as necessary.
	• Plugged radiator	Check and replace radiator as necessary.
	• Faulty radiator cap	Replace.
	• Maladjusted ignition timing	Adjust.
	• Dragging brakes	Adjust brake.
	• Slipping clutch	Adjust or replace.

MAINTENANCE

COOLANT

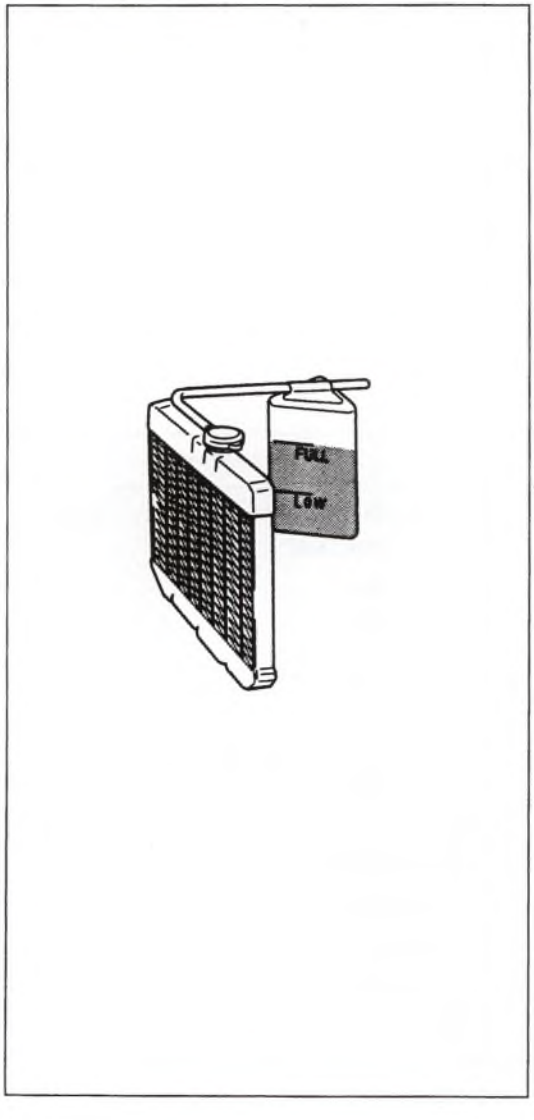
The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the reservoir tank.
When the system cools down, the coolant is drawn back into the radiator.

NOTE:

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene glycol antifreeze (Antifreeze/Anticorrosion coolant) should be used for the purpose of corrosion protection and lubrication.**

ANTI-FREEZE PROPORTIONING CHART

Freezing temperature	°C	−16	−36
Antifreeze/Anticorrosion coolant concentration	%	30	50
Ratio of compount to cooling water	ltr.	1.20/2.80	2.00/2.00



COOLANT LEVEL

Coolant Level

To check level, lift hood and look at ''see-through'' coolant reservoir tank.
It is not necessary to remove radiator cap to check coolant level.

WARNING:
To help avoid danger of being burned:

- **do not remove reservoir tank cap while coolant is ''boiling'', and**
- **do not remove radiator cap while engine and radiator are still hot.**

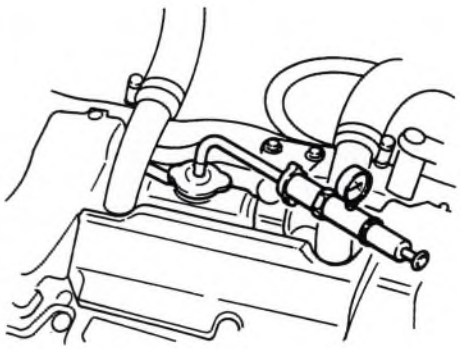
Scalding fluid and steam can be blown out under pressure if either cap is taken off too soon.

When engine is cool, check coolant level in reservoir tank. A normal coolant level should be between ''FULL'' and ''LOW'' marks on reservoir tank.

If coolant level is below ''LOW'' mark, remove reservoir tank cap and add proper coolant to tank to bring coolant level up to ''FULL'' mark. Then, reinstall cap.

NOTE:

- **If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.**
- **When installing reservoir tank cap, align arrow marks on tank and cap.**



COOLING SYSTEM SERVICE

WARNING:
To help avoid danger or being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

Cooling system should be serviced as follows.

1) Check cooling system for leakage or damage.
2) Wash radiator cap and filled neck with clean water by removing radiator cap when engine is cold.
3) Check coolant for proper level and freeze protection.
4) Using a pressure tester, check system and radiator cap for proper pressure holding capacity 90 kPa (0.9 kg/cm^2). If replacement of cap is required, use proper cap specified torque for this vehicle.

 NOTE:
 After installing radiator cap to radiator, make sure that its ear is aligned with reservoir tank hose as shown in figure. If not, turn cap more to align its ear with hose.

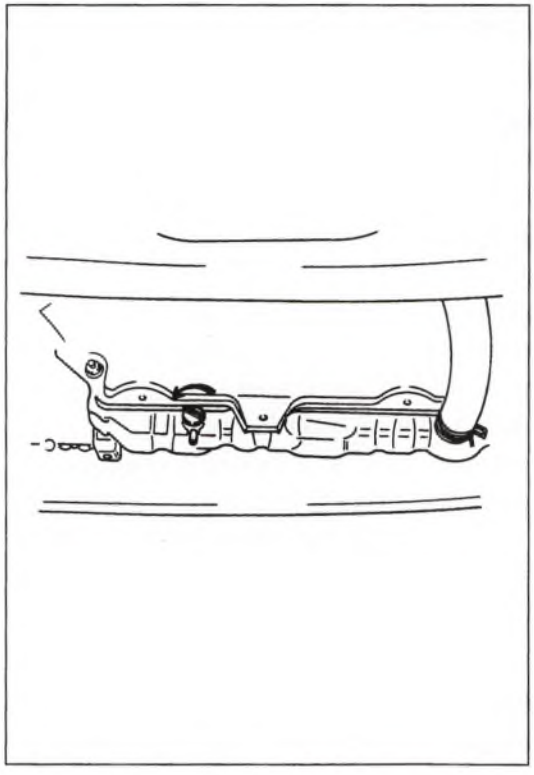
5) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6) Clean frontal area of radiator core.

COOLING SYSTEM FLUSH AND REFILL

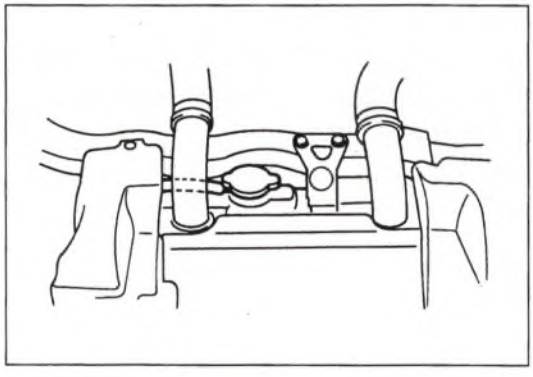
1) Remove radiator cap when engine is cool:
 Turn cap slowly to the left until it reaches a ''stop''. (Do not press down while turning it.)
 Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it to the left.

 WARNING:
 To help avoid danger of being burned, do not remove radiator cap while engine and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

2) With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).

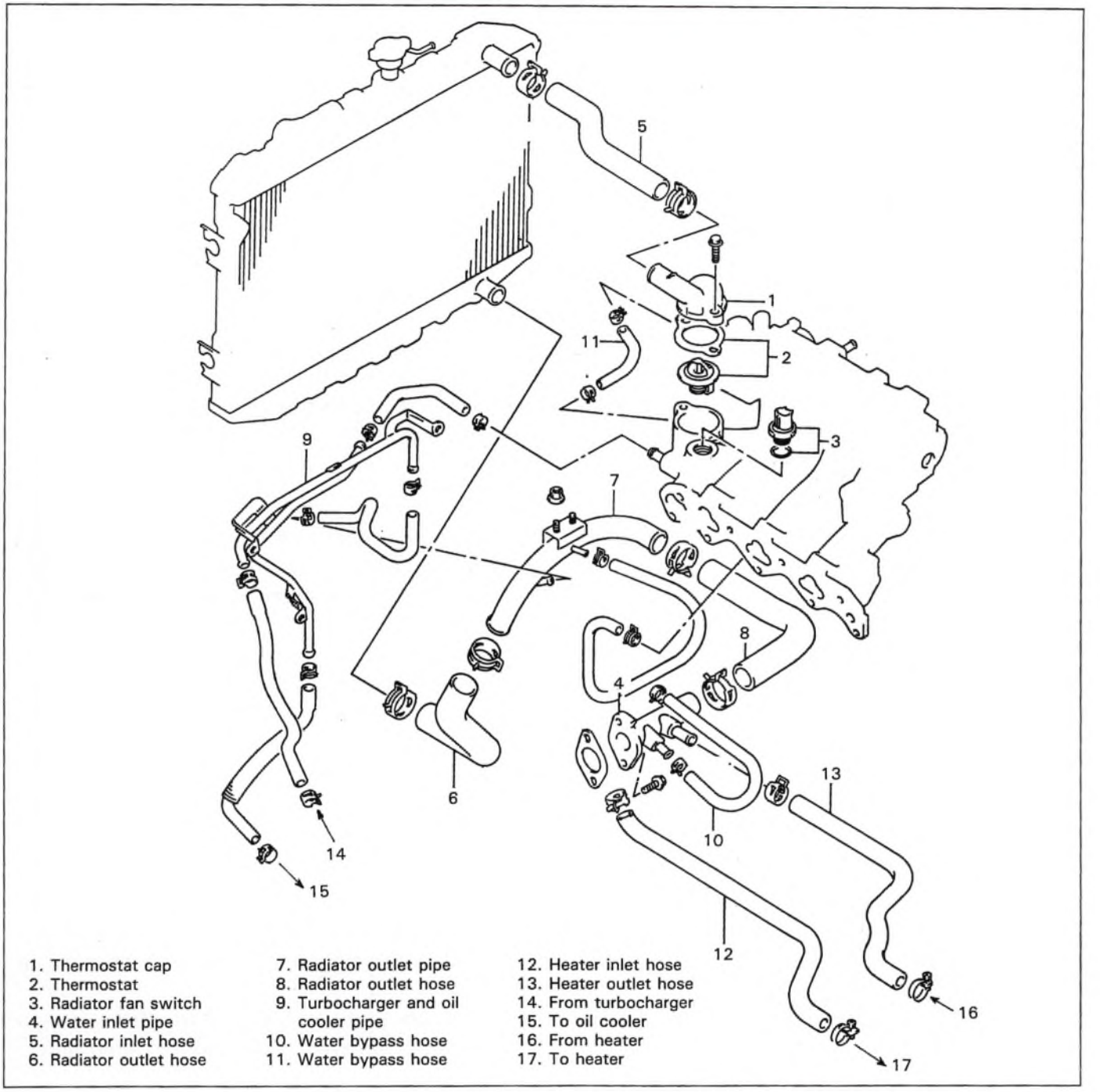


3) Stop engine and open radiator drain plug to drain coolant.
4) Close drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5) Repeat steps 3) and 4) several times until drained liquid is nearly colorless.
6) Drain system and then close radiator drain plug tightly.
7) Disconnect hose from coolant reservoir tank. Remove tank and pour out any fluid. Scrub and clean inside of tank with soap and water.
 Flush it well with clean water and drain. Reinstall tank and hose.



8) Add proper coolant of good quality ethylene glycol antifreeze and water to radiator and tank.
 Fill radiator to the base of radiator filler neck and reservoir tank to "FULL" level mark. Reinstall reservoir tank cap, aligning the arrow marks on the tank and cap.
9) Run engine, with radiator cap removed, until radiator upper hose is hot.
10) With engine idling, add coolant to radiator until level reaches the bottom of filler neck. Install radiator cap, making sure that the ear of cap lines up with reservoir tank hose.

ON-VEHICLE SERVICE



1. Thermostat cap
2. Thermostat
3. Radiator fan switch
4. Water inlet pipe
5. Radiator inlet hose
6. Radiator outlet hose
7. Radiator outlet pipe
8. Radiator outlet hose
9. Turbocharger and oil cooler pipe
10. Water bypass hose
11. Water bypass hose
12. Heater inlet hose
13. Heater outlet hose
14. From turbocharger
15. To oil cooler
16. From heater
17. To heater

WARNING:

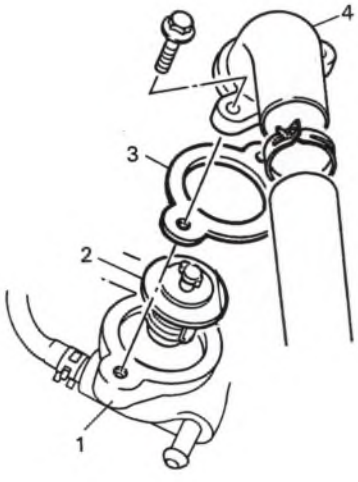
- **Check to make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cord from battery terminal before removing any part.**

COOLING WATER PIPES OR HOSES

REMOVAL

1) Drain cooling system.
2) To remove these pipes or hoses, loosen screw on each pipe or hose clip and pull hose end off.

INSTALLATION
Install removed parts in reverse order of removal procedure, noting the following.
- Tighten each clamp bolt securely.
- Refill cooling system with proper coolant, referring to description on COOLANT of MAINTENANCE.

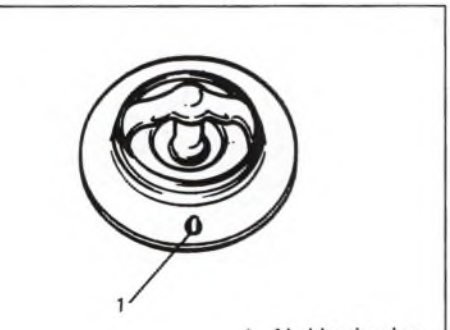


1. Intake manifold
2. Thermostat
3. Gasket
4. Thermostat cap

THERMOSTAT

REMOVAL
1) Disconnect negative cable at battery.
2) Drain cooling system and tighten drain plug.
3) Disconnect thermostat cap from thermostat case.
4) Remove thermostat.

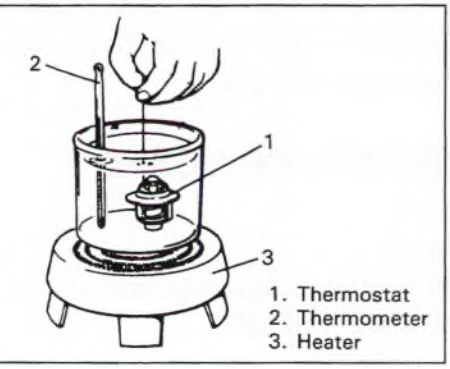
INSTALLATION
1) When positioning thermostat on intake manifold, be sure to bring its air bleed valve comes front side of vehicle.
2) Install new gasket and thermostat cap to thermostat case.
3) Fill cooling system.
4) Connect negative cable.
5) After installation, check each part for leakage.



1. Air bleed valve

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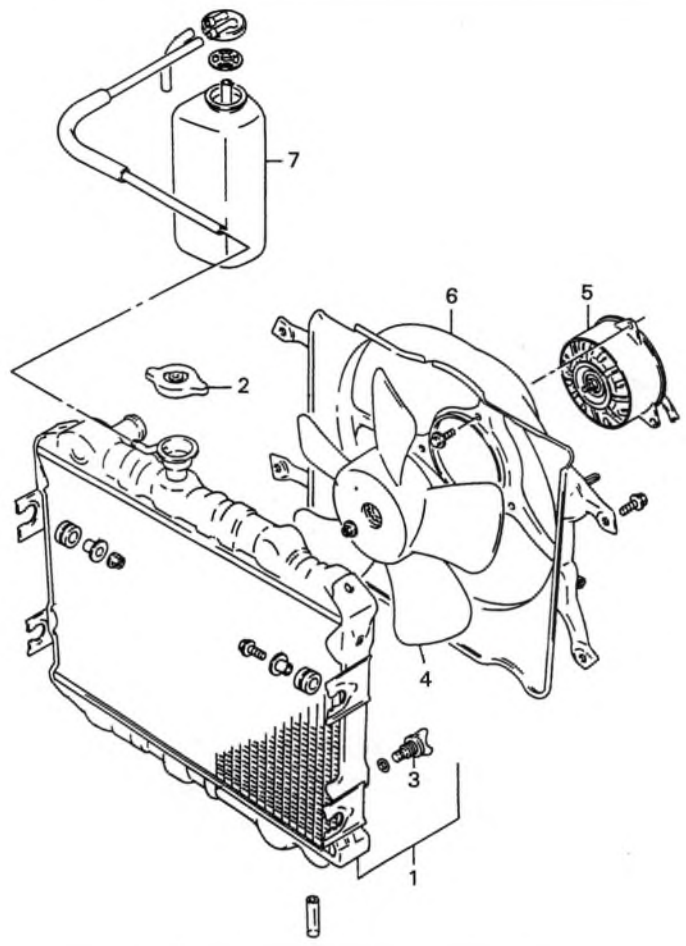
INSPECTION
1) Make sure that air bleed valve of thermostat is clean. Should this valve be clogged, engine would tend to overheat.
2) Check to make sure that valve seat is free from foreign matters which would prevent valve from seating tight.



1. Thermostat
2. Thermometer
3. Heater

3) Check thermostatic movement of wax pellet as follows:
 1. Immerse thermostat in water, and heat water gradually.
 2. Check that valve starts to open at specific temperature.
 3. If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if re-used, will bring about overcooling or overheating tendency.

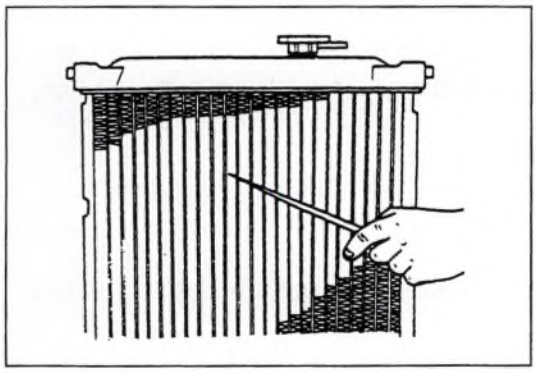
RADIATOR



1. Radiator
2. Radiator cap
3. Drain plug
4. Cooling fan
5. Cooling fan motor
6. Fan shroud
7. Water reservoir tank

REMOVAL

1) Disconnect negative cable at battery.
2) Drain cooling system by loosening drain plug of radiator.
3) Disconnect coupler of cooling fan motor lead wire.
4) Disconnect radiator inlet and outlet hoses, and reservoir tank hose.
5) Remove radiator and cooling fan motor.



INSPECTION

Check radiator for leakage or damage. Straighten bent fins, if any.

CLEANING

Clean frontal area of radiator cores.

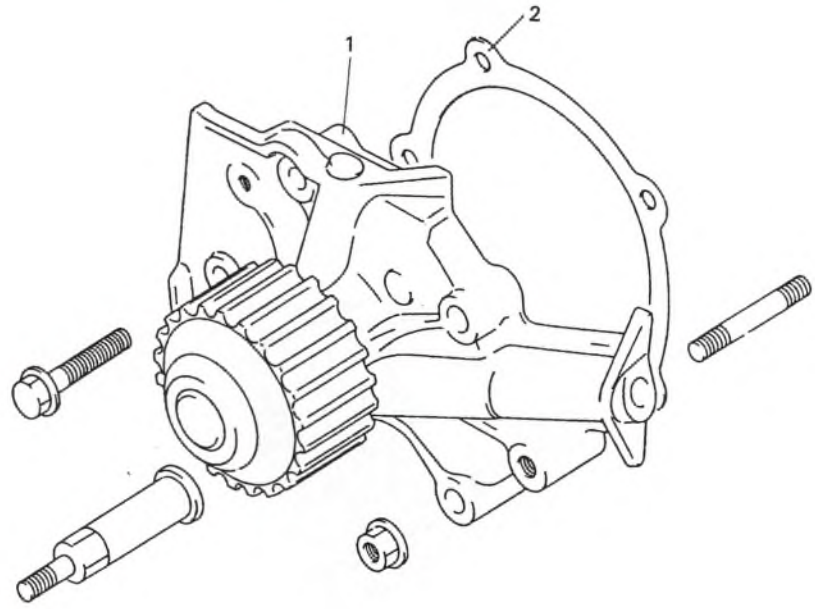
INSTALLATION

Reverse removal procedures.

NOTE:

- **Refill cooling system with proper coolant referring to COOLANT item of MAINTENANCE.**
- **After installation, check each joint for leakage.**

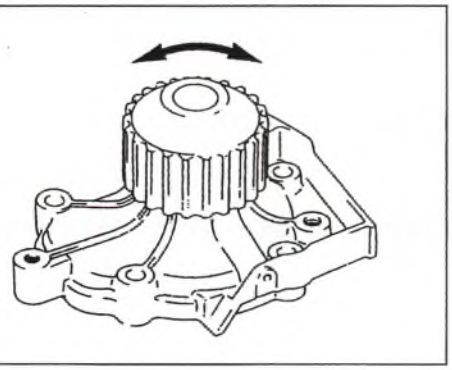
WATER PUMP



1. Water pump
2. Gasket

REMOVAL

1) Disconnect negative cable at battery.
2) Drain cooling system.
3) Remove timing belt and tensioner according to procedure described in item "TIMING BELT AND TENSIONER" of SECTION 6A.
4) Remove water pump assembly.



INSPECTION

NOTE:
Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.

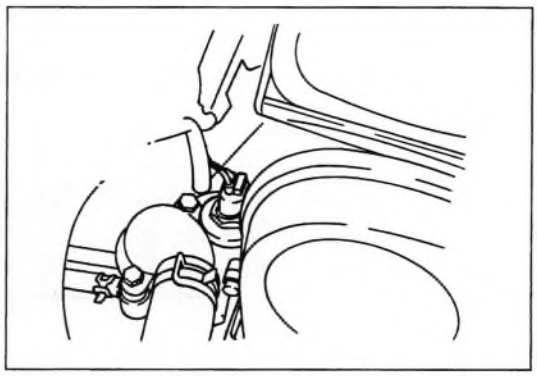
INSTALLATION

Install in reverse order of removal procedure noting following points.

- Install new pump gasket to cylinder block.
- Torque water pump bolts/nut to specification.

Tightening Torque for water pump
10—13 N·m (1.0—1.3 kg-m)

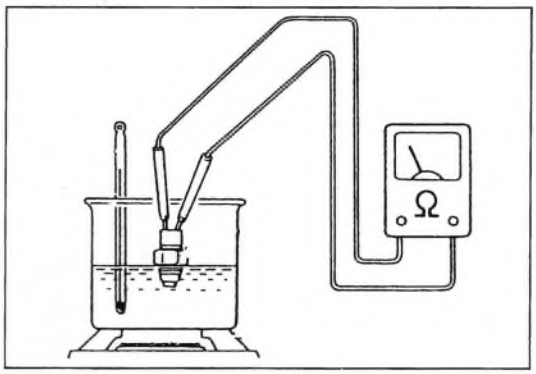
- After installation, check each part for leakage.



RADIATOR FAN THERMO SWITCH

REMOVAL

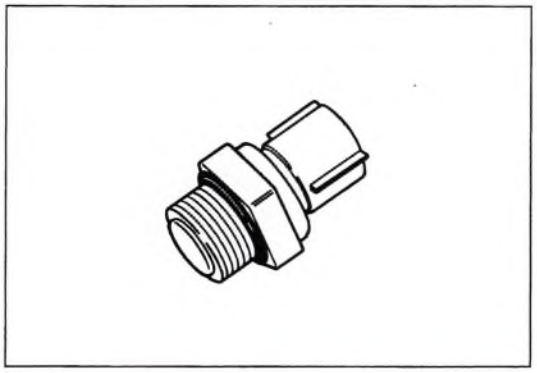
1) Disconnect negative cable at battery.
2) Drain cooling system.
3) Disconnect coupler or thermo switch lead wire.
4) Remove thermo switch from intake manifold.



INSPECTION

1) Connect an ohmmeter to the thermo switch.
2) Immerse the switch in water, and heat water gradually.
3) Check that the switch turns "ON" or "OFF" according to the below specification. If the switch is faulty, replace it.

Fan thermo switch functional spec.	
Temp. at switch "ON" (Continuity)	More than 93°C
Temp. at switch "OFF" (No continuity)	Less than 88°C

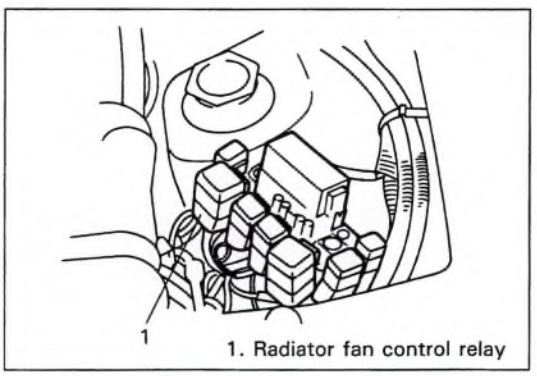


INSTALLATION

Install in reverse removal procedure noting following points.

- Install new O-ring and apply engine oil.
- Torque radiator fan thermo switch to specification.

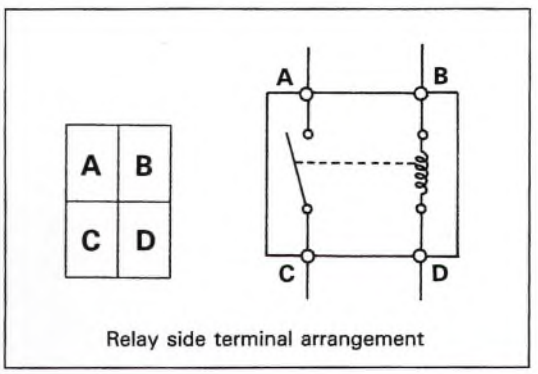
Tightening Torque to radiator fan thermo switch:
15—30 N·m (1.5—3.0 lb-ft)



1. Radiator fan control relay

RADIATOR FAN CONTROL RELAY

NOTE:
Make sure of wire colors to distinguish radiator fan control relay from other relays.
Terminal A: Bl/G
Terminal B: Bl/W
Terminal C: Bl/R
Terminal D: B



Relay side terminal arrangement

INSPECTION

1) Check continuity between each two terminals as shown below.

Between A and C: Infinity
Between B and D: Continuity

2) Check that there is continuity between terminals "A" and "C" when battery is connected to terminals "B" and "D". If found defective, replace.

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Engine coolant (Ethylene glycol base coolant)	Anti-freeze/Anti-corrosion coolant	Additive to engine cooling system for improving cooling efficiency and for protection against rusting.

60A50-6B-20-1S

SECTION 6C

ENGINE FUEL

6C

CONTENTS

GENERAL DESCRIPTION 6C-1
- Fuel System 6C-1
- Fuel Tank 6C-2
- Fuel Pump Refer to SECTION 6E
- Fuel Filler Cap 6C-2
- Fuel Filter 6C-2

ON-VEHICLE SERVICE 6C-3
- Fuel Lines 6C-3
- Fuel Pipe 6C-4
- Fuel Filler Cap 6C-4
- Fuel Filter 6C-5
- Fuel Tank 6C-6

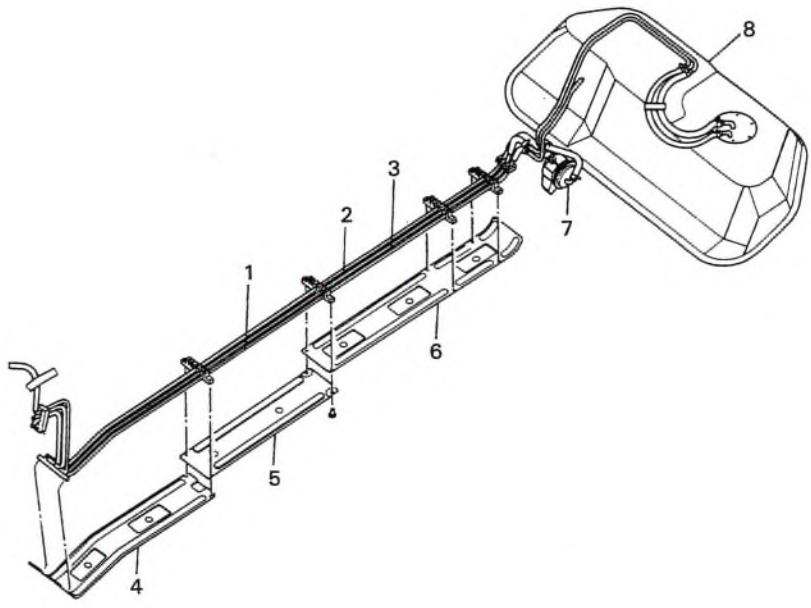
CAUTION:
THE ENGINE OF THIS VEHICLE REQUIRES THE USE OF UNLEADED FUEL ONLY. USE OF LEADED AND/OR LOW LEAD FUEL CAN RESULT IN ENGINE DAMAGE AND REDUCE THE EFFECTIVENESS OF THE EMISSION CONTROL SYSTEM.

64B40-6C-1-1

GENERAL DESCRIPTION

FUEL SYSTEM

The main components of the fuel system are fuel tank, fuel pump, fuel filter, fuel level gauge, delivery pipe, pressure regulator and it includes three lines; fuel feed line, fuel return line and fuel vapor line. For the details of fuel flow and fuel vapor flow, refer to "ELECTRONIC FUEL INJECTION SYSTEM" section and "ENGINE EMISSION CONTROL" section respectively.

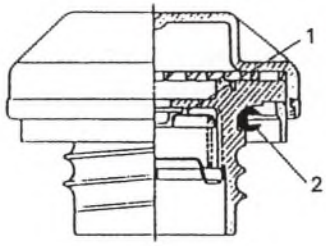


1. Canister inlet pipe
2. Fuel feed pipe
3. Fuel return pipe
4. Fuel pipe No.1 cover
5. Fuel pipe No.2 cover
6. Fuel pipe No.3 cover
7. Fuel filter
8. Fuel tank

64B40-6C-1-2

FUEL TANK

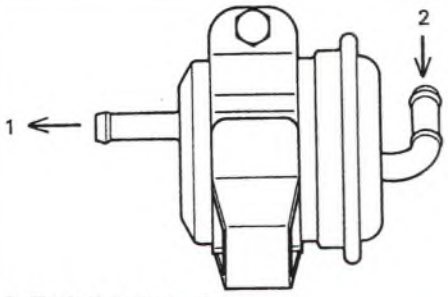
The fuel tank is located under the rear of the vehicle. The fuel pump and fuel level gauge are installed on the upper part of fuel tank.



1. Vacuum relief valve
2. Gasket

FUEL FILLER CAP

The fuel tank filler neck has a pressure-vacuum cap.
A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would prevent sealing fuel vapors.
After the gasket on fuel filler cap and the filler neck flange contact, the ratchet produces a loud clicking noise, indicating the seal has been set.
This cap has a vacuum relief valve inside.
The vacuum relief valve opens to relieve the vacuum created in the fuel tank.



1. To fuel delivery pipe
2. From fuel tank

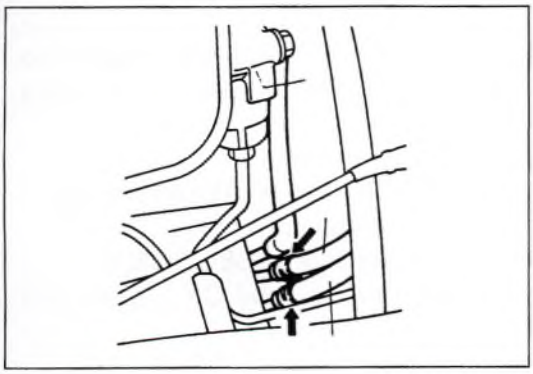
FUEL FILTER

The fuel filter is located in front of fuel tank as shown in page 6C-1 and filters the fuel sent under pressure from the fuel pump.
As it can't be disassembled, it must be replaced as an assembly.

ON-VEHICLE SERVICE

WARNING:
Before attempting service of any type on fuel system, following cautions should be always observed.

- **Disconnect negative cable at battery.**
- **DO NOT smoke, and place "NO SMOKING" signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).**
- **Wear safety glasses.**
- **To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.**
- **As fuel feed line is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure according to procedure described on p. 6-4.**
- **A small amount of fuel may be released after the fuel line is disconnected. In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to SECTION 6.**

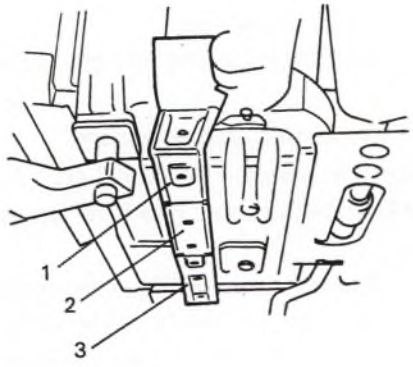


FUEL LINES

Due to the fact that fuel feed line is under high pressure, use special care when servicing it.

INSPECTION

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration, or damage.
Make sure all clamps are secure.
Replace parts as needed.



1. Pipe cover No.1
2. Pipe cover No.2
3. Pipe cover No.3

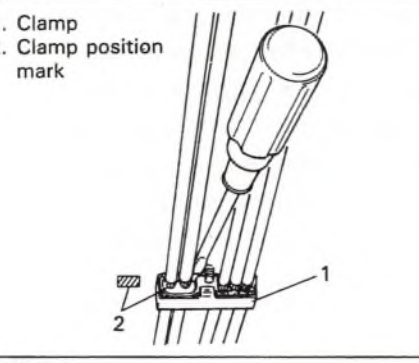
FUEL PIPE

REMOVAL

1) Relieve fuel pressure in fuel feed line according to procedure on p. 6-4.
2) Disconnect negative cable at battery.
3) Disconnect fuel hose from fuel pipe at the front and rear of each fuel pipe.

WARNING:
A small amount of fuel may be released after fuel hose is disconnected. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.

4) Disconnect brake pipe from pipe joint referring to SECTION 5.
5) Remove pipe cover No.1, No.2 and No.3 from body.



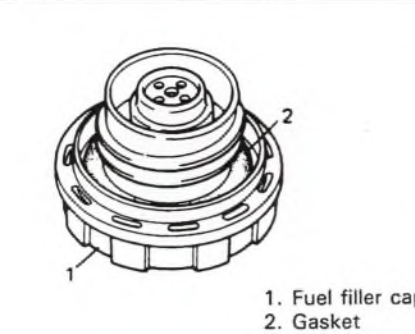
1. Clamp
2. Clamp position mark

64B40-6C-4-3

6) Put clamp position mark on body and pipes so that clamps can be installed on original position.
7) Remove pipes with clamp from body.
8) Remove clamp from pipes.

INSTALLATION

1) Install clamps to marked position on pipes. If clamp is deformed or its claw is bent or broken, replace it with new one.
2) Install pipes with pipe clamp to body.
3) Install pipe covers to body. Be sure to use new nuts.
4) Connect fuel hoses to fuel pipes.
5) Connect brake pipe joints referring to SECTION 5.
6) With engine "OFF" and ignition switch "ON", check for fuel leaks.
7) Bleed air in brake system referring to SECTION 5.

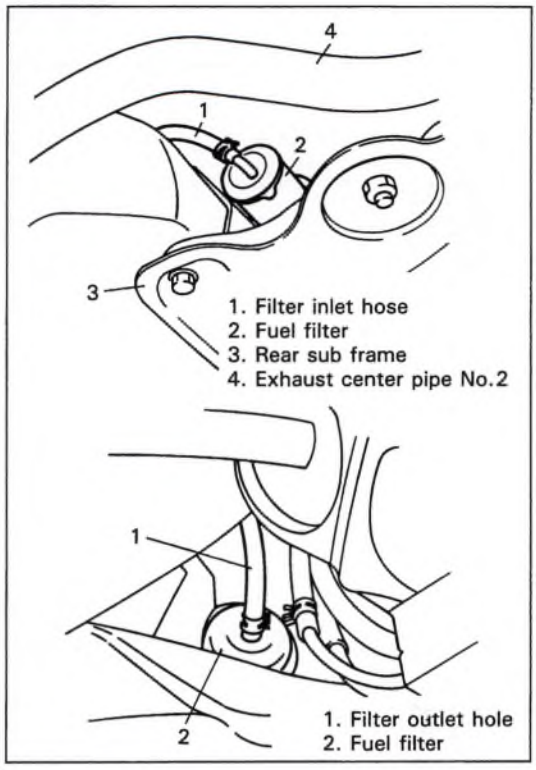


1. Fuel filler cap
2. Gasket

64B40-6C-5-2

FUEL FILLER CAP

Remove cap, and check gasket for even filler neck imprint, and deterioration or any damage. If gasket is in malcondition, replace cap.



FUEL FILTER

REMOVAL

1) Relieve fuel pressure in fuel feed line according to procedure described on p. 6-4.
2) Disconnect negative cable at battery.
3) Hoist vehicle.
4) Place fuel container under fuel filter.
5) Disconnect inlet hose from fuel filter.

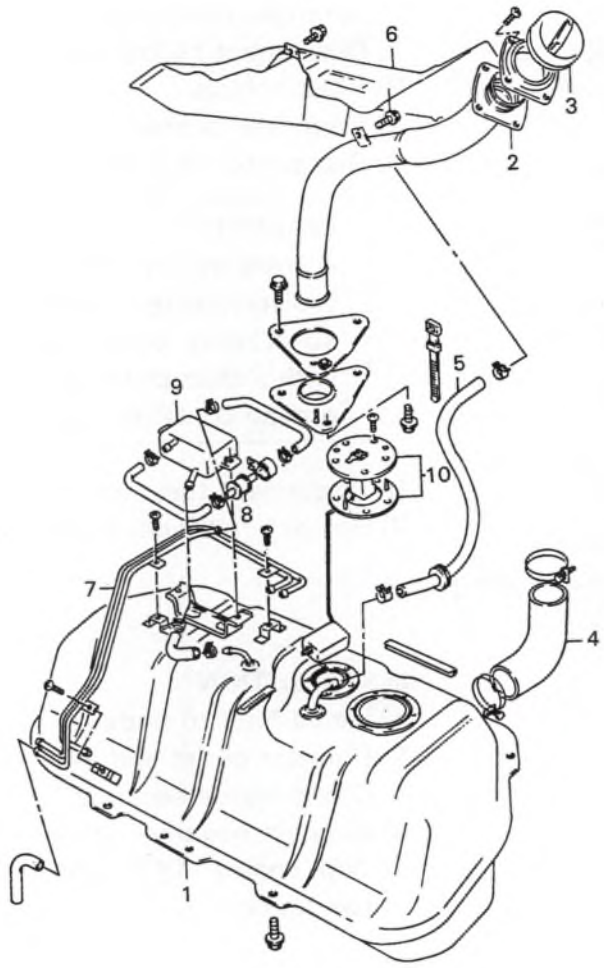
WARNING:
A small amount of fuel may be released after fuel hose is disconnected. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.

6) Disconnect fuel filter outlet hose from fuel filter.
7) Remove fuel filter from body.

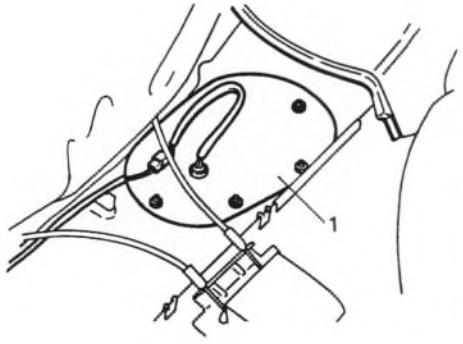
INSTALLATION

1) Install filter to body.
2) Connect outlet and inlet hoses.
 Clamp hoses securely.
3) Connect negative cable to battery.
4) With engine "OFF" and ignition switch "ON", check for fuel leaks.

FUEL TANK



1. Fuel tank
2. Fuel filler neck
3. Fuel filler cap
4. Fuel filler hose
5. Breather hose
6. Fuel neck cover
7. Fuel outlet pipe
8. 2-way check valve
9. Fuel vapor separator
10. Fuel level gauge



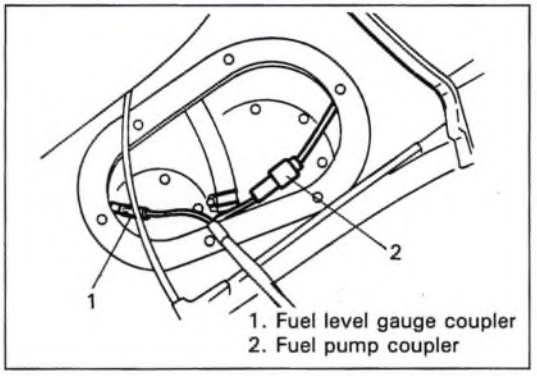
1. Fuel tank service lid

REMOVAL

1) Relieve fuel pressure in fuel feed line according to procedure described on p. 6-4.
2) Disconnect negative cable at battery.
3) Drain fuel tank through fuel filler hose.

CAUTION:
Never drain or store fuel in an open container to avoid possibility of fire or explosion.

4) Remove floor console box and cabin back trim and then remove fuel tank service hole lid.



1. Fuel level gauge coupler
2. Fuel pump coupler

5) Disconnect fuel level gauge lead wire and fuel pump lead wire at each coupler.
6) Hoist vehicle.
7) Remove differential
8) Remove rear sub frame.
9) Remove hoses from fuel tank.
10) Remove fuel tank from body.

INSTALLATION

Install in reverse order of removal procedure noting following points.

- Clamp hoses and wire harnesses securely.
- After installation, with engine "OFF" and ignition switch "ON", check for fuel leaks.

SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM

(Multi-Port Fuel Injection System)

6E

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GENERAL DESCRIPTION

The Electronic Fuel Injection system in this vehicle supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions.
It uses the multi-port fuel injection system which injects fuel into the each intake port of the cylinder head.

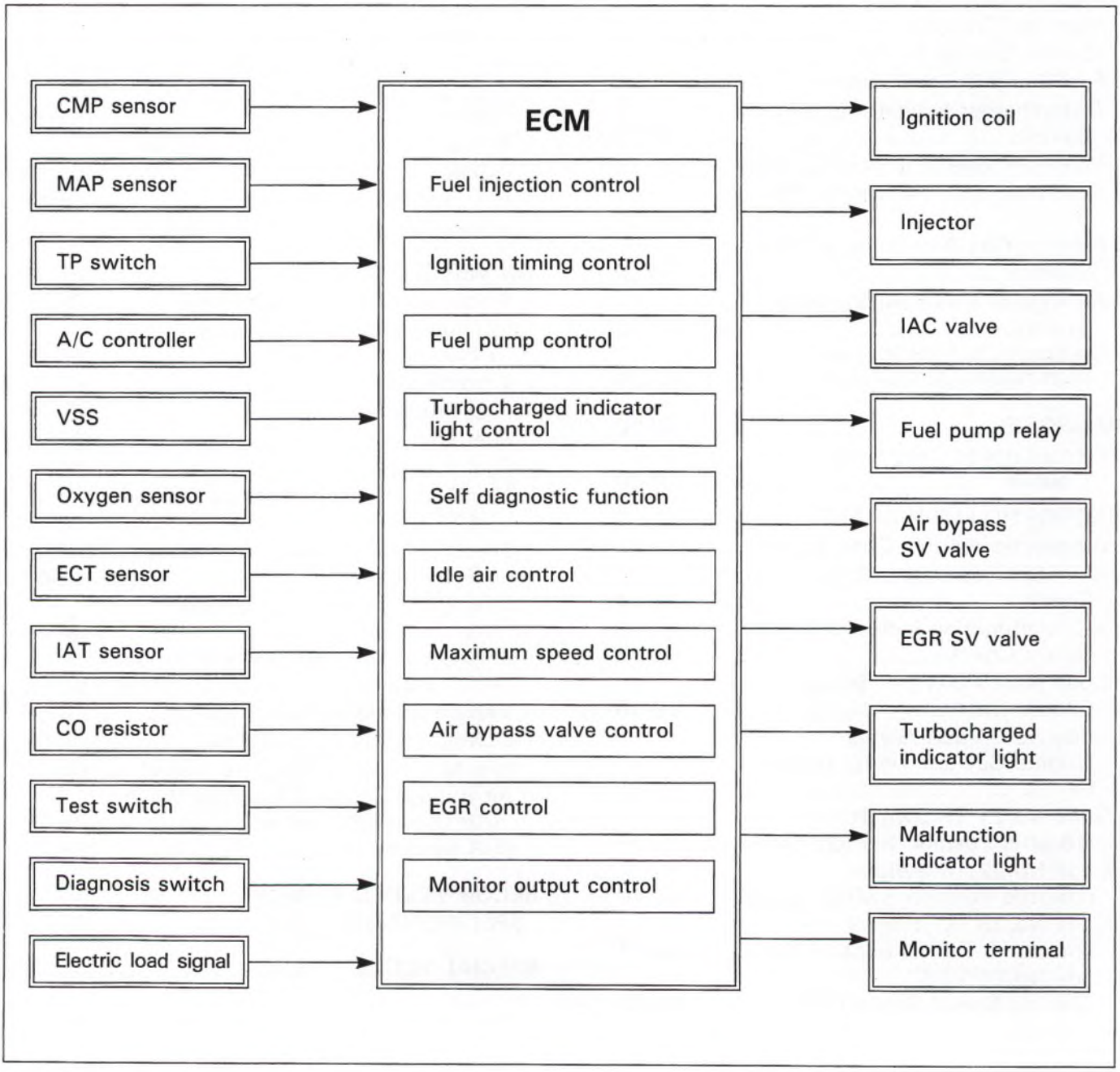
This system has 3 major sub-systems: air intake system, fuel delivery system and electronic control system.
Air intake system includes air cleaner, manifold absolute pressure sensor, throttle body, fast idle air valve, idle air control valve and intake manifold.

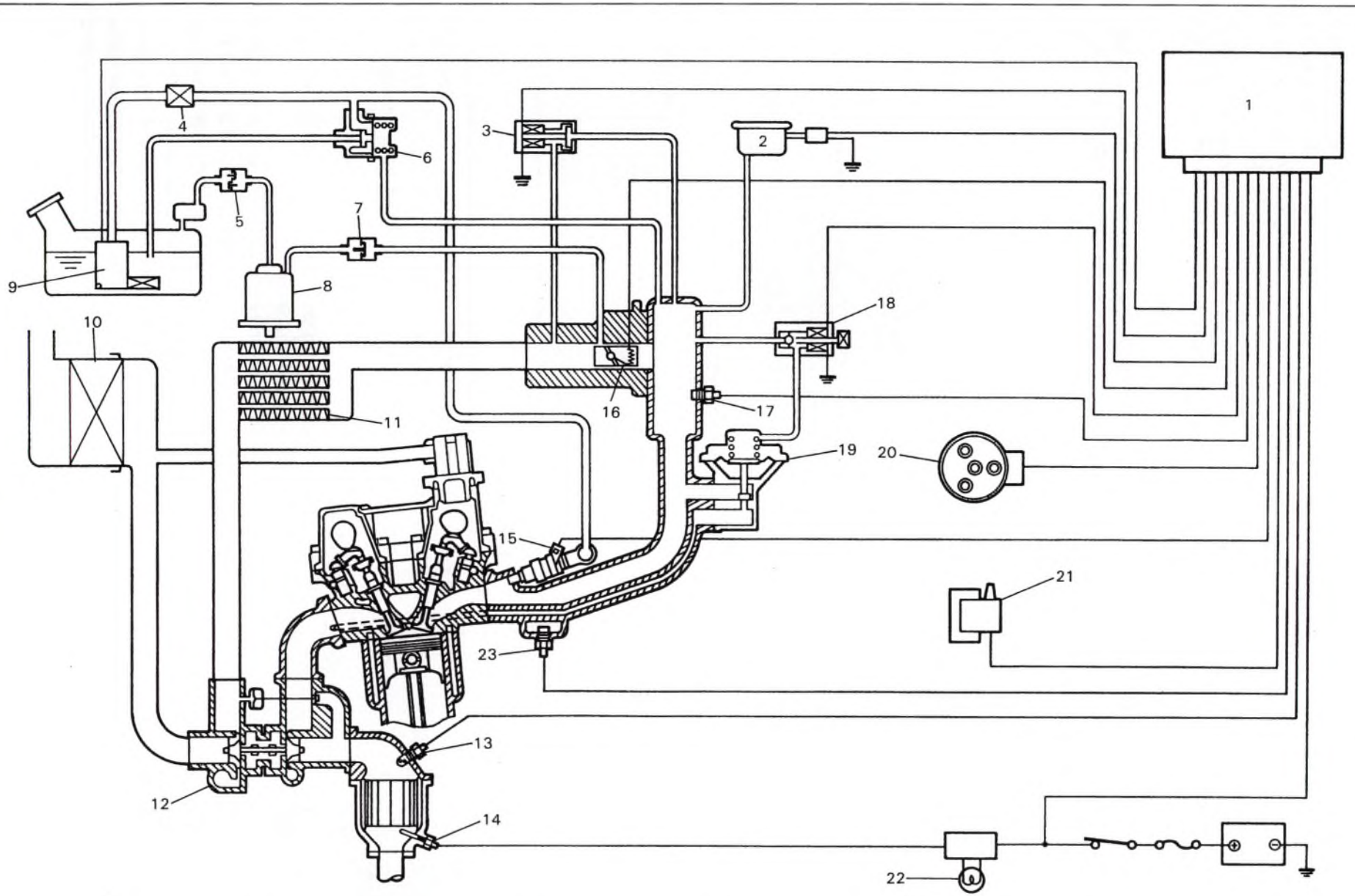
Fuel delivery system includes fuel pump, delivery pipe (fuel pressure regulator), etc.

Electronic control system includes ECM, various sensors and controlled devices.

This section explains the system related to the electronic fuel injection as well as such functions of ECM as listed below.

- EGR system.
- ESA (Electronic Spark Advance) system.





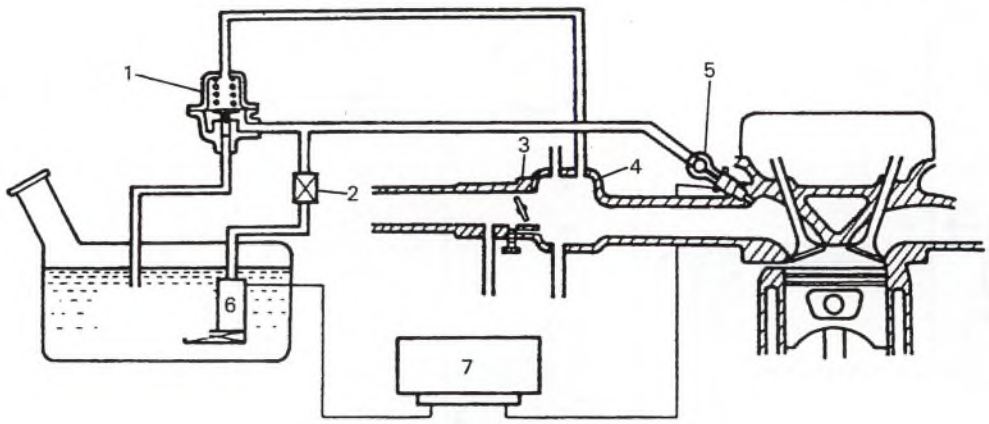
1. ECM
2. MAP sensor
3. IAC valve
4. Fuel filter
5. Tank pressure control valve
6. Fuel pressure regulator
7. 1-way valve
8. EVAP canister
9. Fuel pump
10. Air cleaner
11. Intercooler
12. Turbocharger
13. Oxygen sensor
14. Thermo fuse
15. Injector
16. TP switch
17. IAT sensor
18. EGR SV valve
19. EGR valve
20. Distributor
21. Ignition coil
22. Warning light
23. ECT sensor

FUEL DELIVERY SYSTEM

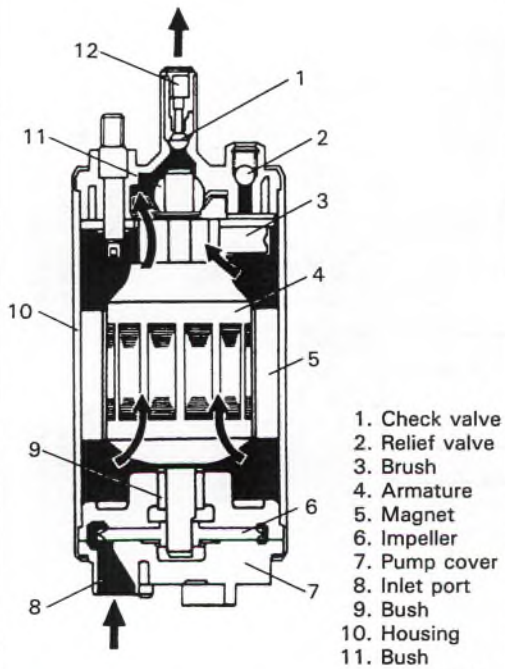
The fuel delivery system consists of the fuel tank, fuel pump, fuel filter, fuel pressure regulator, delivery pipe and fuel injectors.

The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to each injector through the delivery pipe. As the fuel pressure applied to the injector (the fuel pressure in the fuel feed line) is always kept a certain amount higher than the pressure in the surge tank by the fuel pressure regulator, the fuel is injected into the intake port of the cylinder head when the injector opens according to the injection signal from ECM.
The fuel relieved by the fuel pressure regulator returns through the fuel return line to the fuel tank.

For the structure and operation of the fuel tank and filter, refer to SECTION 6C "ENGINE FUEL".



1. Fuel pressure regulator
2. Fuel filter
3. Throttle body
4. Surge tank
5. Injector
6. Fuel pump
7. ECM



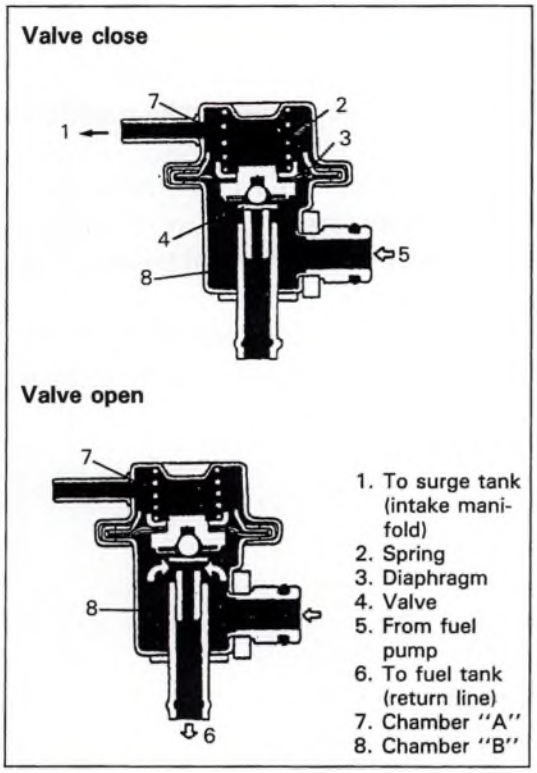
1. Check valve
2. Relief valve
3. Brush
4. Armature
5. Magnet
6. Impeller
7. Pump cover
8. Inlet port
9. Bush
10. Housing
11. Bush
12. Outlet port

FUEL PUMP

The electric fuel pump located in the fuel tank consists of armature, magnet, impeller, brush, check valve, etc.. The ECM controls its ON/OFF operation as described under "Fuel Pump Control System" included in later part of this section.

Operation

When power is supplied to the fuel pump, the motor in the pump runs and so does the impeller.
This causes a pressure difference to occur between both sides of the impeller as there are many grooves around it. Then the fuel is drawn through the inlet port, and with its pressure increased it is discharged through the outlet port.
The fuel pump also has a relief valve to prevent excessive rise of the discharge pressure and a check valve to keep some pressure in the fuel feed line even when the fuel pump is stopped.

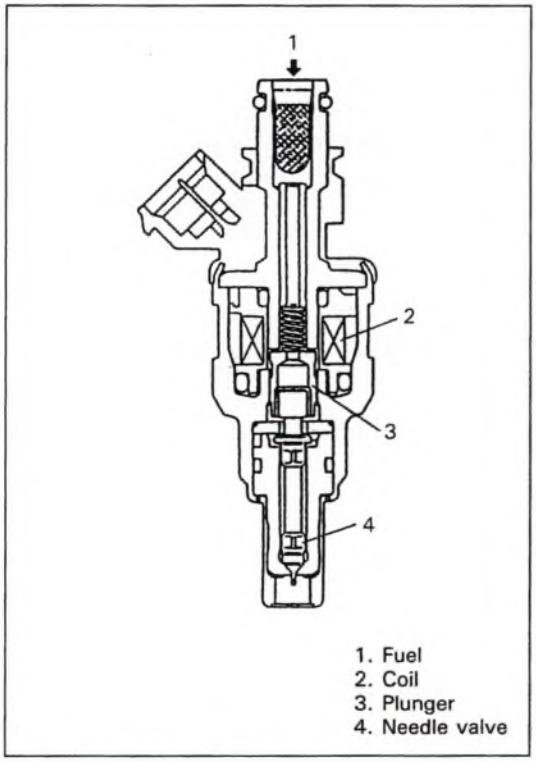


FUEL PRESSURE REGULATOR

The fuel pressure regulator is diaphragm-operated relief valve consisting of diaphragm, spring and valve. It keeps the fuel pressure applied to the injector 220 kPa (2.20 kg/cm²) higher than that in the surge tank at all times.

The pressure applied to the chamber "A" of fuel pressure regulator is intake manifold pressure and that to the chamber "B" is fuel pressure.

When the fuel pressure rises more than 220 kPa (2.20 kg/cm²) higher than the surge tank pressure, the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank via the return line.

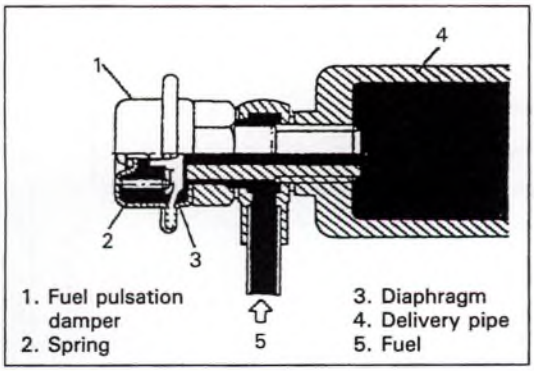


FUEL INJECTOR

There are 3 injectors (one for each cylinder), each of which is installed between the cylinder head and delivery pipe. It is an electromagnetic type injection nozzle which injects fuel into the intake port of the cylinder head according to the signal from ECM.

Operation

When the solenoid coil of the injector is energized by ECM, it becomes an electromagnet and attracts the plunger. At the same time, the needle valve which is incorporated with the plunger opens and the injector which is under the fuel pressure injects fuel. As the lift stroke of the needle valve of the injector is set constant, the amount of fuel injected at one time is determined by the length of time during which the solenoid coil is energized (injection time).



FUEL PULSATION DAMPER

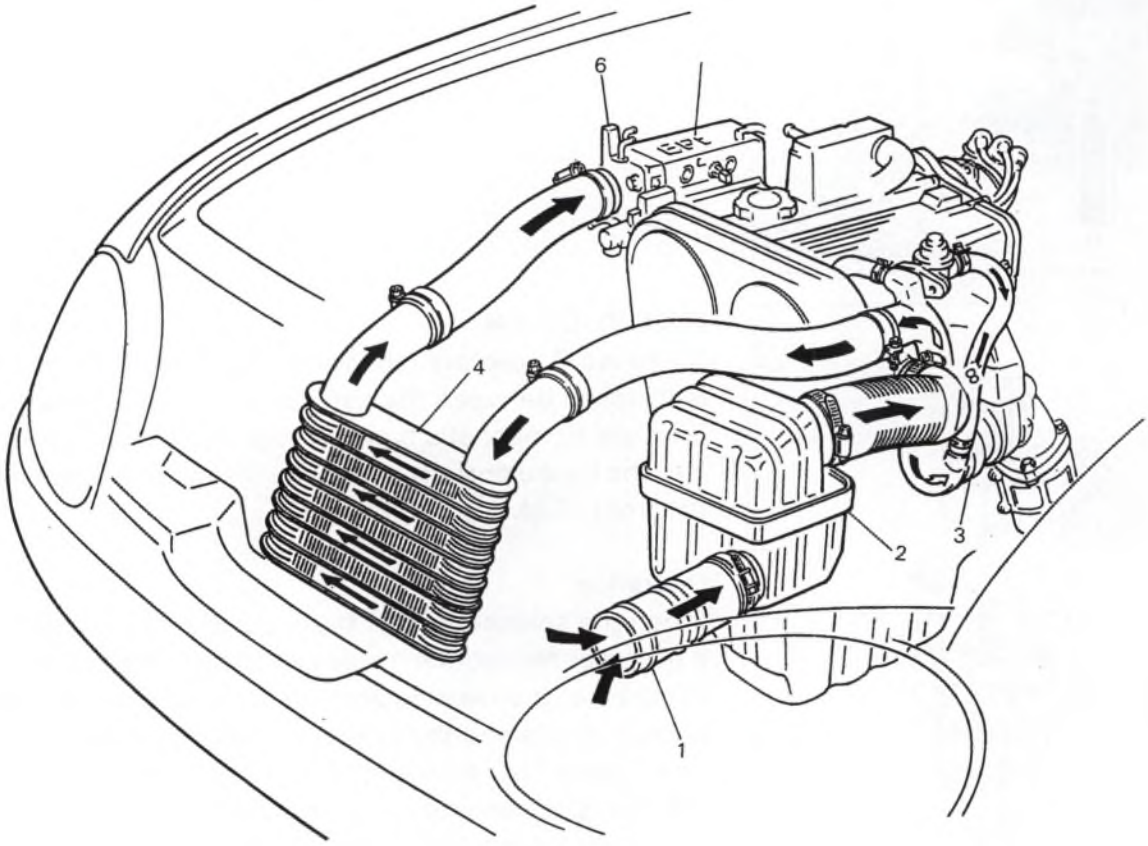
The fuel pulsation damper is installed to the delivery pipe. The fuel pressure applied to the injector is regulated to a certain level by the fuel pressure regulator, but as it is affected when the injector injects fuel, a slight change occurs in it. (pulsation) Then the fuel pulsation damper absorbs this pulsation.

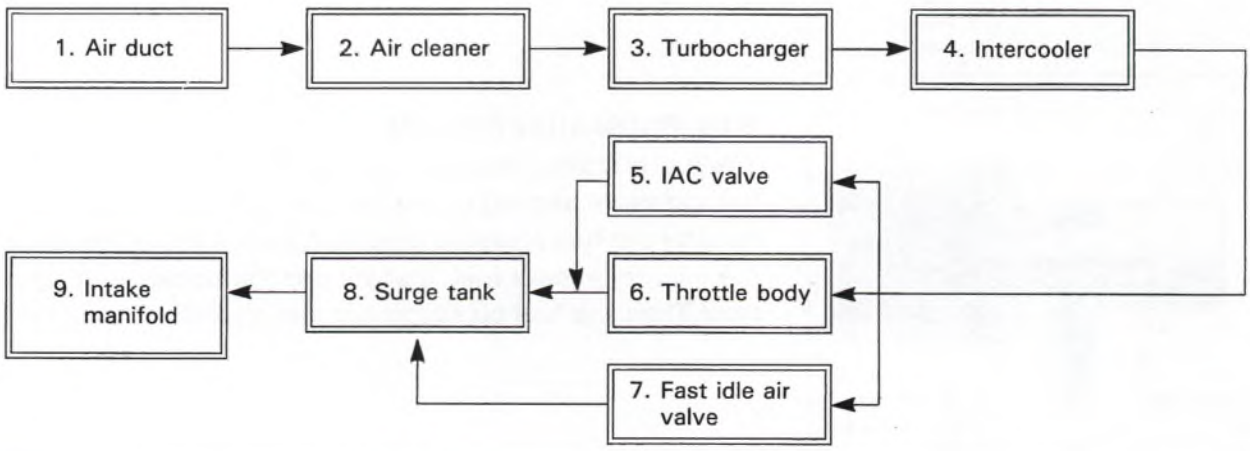
AIR INTAKE SYSTEM

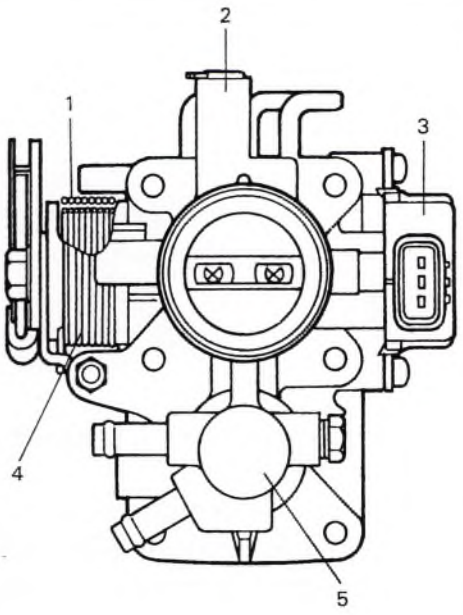
The intake air, after being filtered through the air cleaner and pressurized by the turbocharger, flows through the intercooler and throttle body into the surge tank and is distributed to the intake manifold of each cylinder.

The amount of the intake air is metered indirectly by using the data of pressure in the surge tank measured by the MAP sensor and the engine speed. When the engine coolant temperature is low, FIA valve opens to supply the air to the surge tank, bypassing the throttle valve, so as to help the engine warmed up quickly.

When the engine is idling, when it is cold or when the idle air control valve is opened according to the signal from ECM, the air bypasses the throttle valve through bypass passage which varies in each case and is finally drawn into the intake manifold.





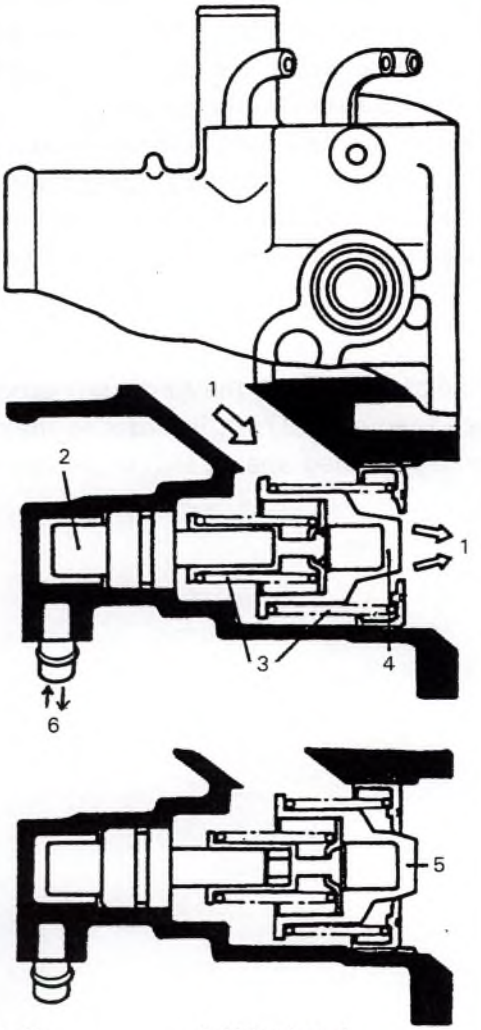


1. Outer spring
2. Idle speed adjusting screw
3. TP switch
4. Inner spring
5. Fast idle air valve

THROTTLE BODY

The throttle body consists of the main bore air bypass passage. FIA valve, vacuum passages and following parts.

- Throttle valve which is interlocked with accelerator pedal and controls the amount of the intake air.
- Idle speed adjusting screw which controls the amount of bypass air to adjust engine idle speed.
- TP switch which detects the throttle valve position (idle or wide open) and sends a signal to ECM.



1. Air
2. Thermo-wax
3. Spring
4. Valve (open)
5. Valve (close)
6. Engine coolant

FAST IDLE AIR VALVE

The air valve located on throttle body consists of thermo-wax, springs and valve.

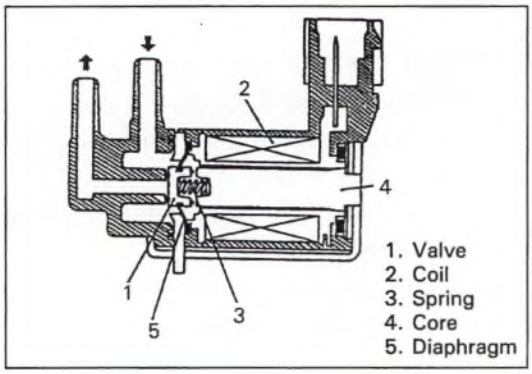
When the engine is cold, it sends the air into the intake manifold without letting it pass through the throttle valve to increase the engine speed, and thus the engine is warmed up.

Operation

When the engine is cold (or engine coolant temp. is lower than about 60°C), the thermo-wax contracts.

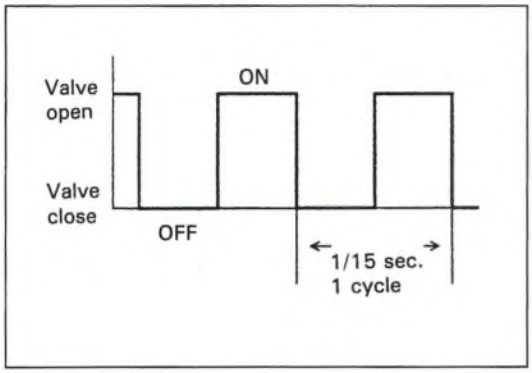
In this state, the valve opens by the spring force, allowing the air to be drawn into the intake manifold. Thus the amount of intake air increases even when the throttle valve is fully closed and the engine speed rises to the fast idle state which is higher than the idle speed.

As the engine is warmed up, the thermo-wax expands gradually, then the piston pushes down the valve gradually, and the amount of air passing through the air valve decreases and so does the engine speed. When the engine coolant temperature reaches about 60°C, the valve is fully closes and the engine speed is back to the normal idle speed.



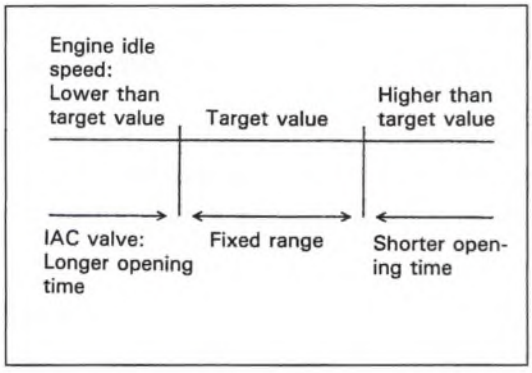
IDLE AIR CONTROL VALVE (IAC VALVE)

The IAC valve opens and closes air bypass passage according to the signal from ECM.
When it opens, the air is supplied to the intake manifold.

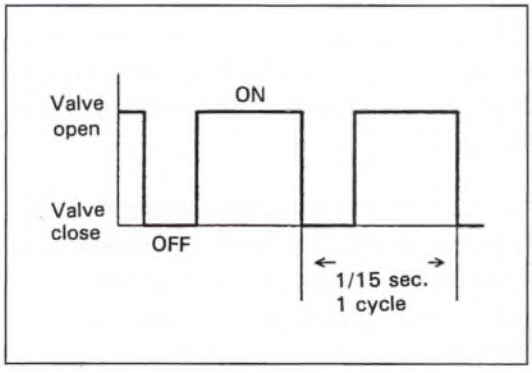


Operation

IAC valve opens the bypass air passage when it is turned ON by ECM and closes it when turned OFF.
ECM detects the engine condition by using signals from various sensors and switches and while repeating ON and OFF cycle of IAC valve at a certain rate (15 times a second), it controls bypass air flow by increasing and decreasing its ON time within a cycle.



When the engine has been warmed up completely and the throttle valve is at the idle position, ECM controls the IAC valve opening time (time during which the coil is energized) so that the engine idle speed satisfies the target value.
For example, when the engine idle speed is lower than the target value, IAC valve opening time is made longer gradually till the target value is satisfied. When the engine idle speed has reached the target value, IAC valve opening time is fixed.

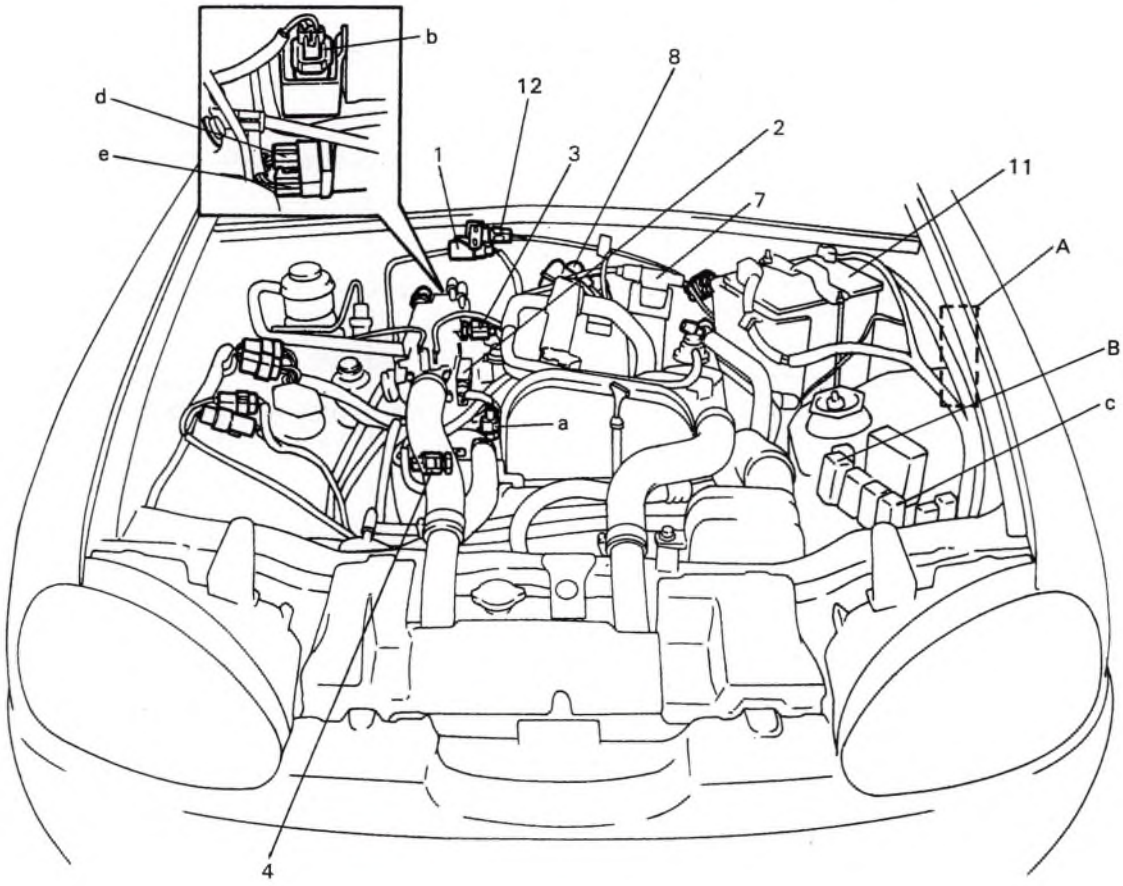


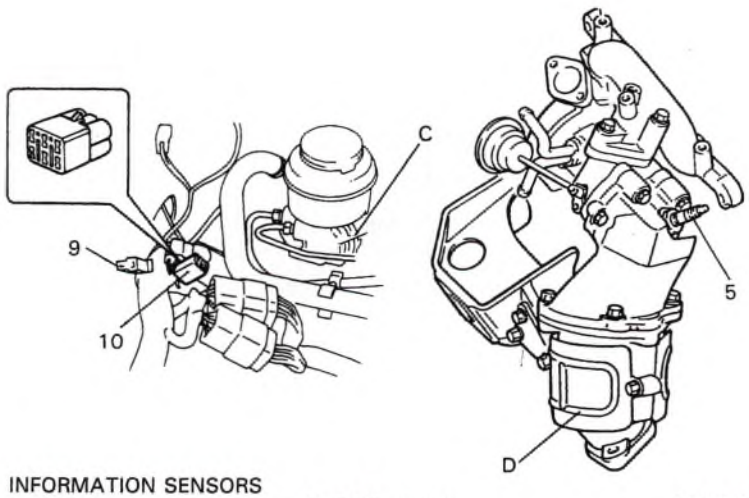
At a high temperature and at a highland, the air density drops and the engine idle speed reduces. Then, in order to maintain the engine speed at a specified speed, IAC valve opening time is made longer.

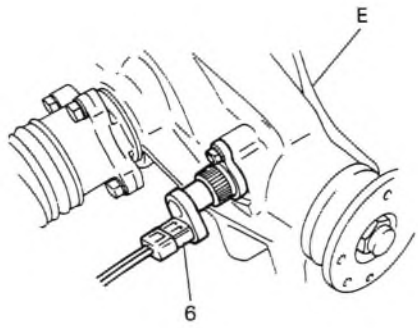
ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices.
Functionally, it is divided into six sub systems:

- Fuel injection control system
- Idle air control system
- Fuel pump control system
- EGR system
- Air bypass SV valve control system
- ESA (Electronic Spark Advance) system





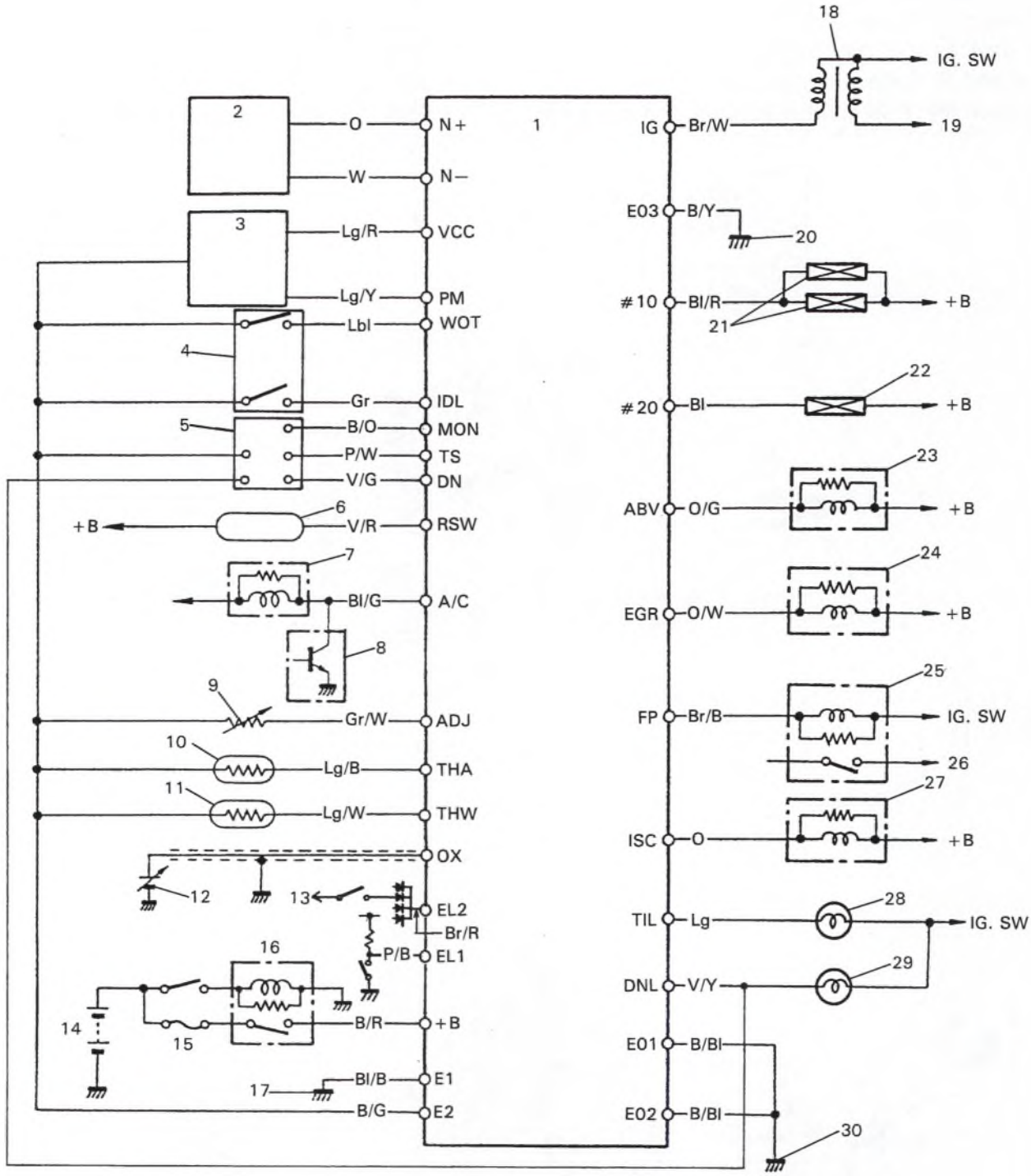


INFORMATION SENSORS
1. MAP sensor
2. TP switch
3. IAT sensor
4. ECT sensor
5. Oxygen sensor
6. Vehicle speed sensor
7. Ignition coil
8. CMP sensor
9. CO adjust coupler
10. Monitor coupler (Diagnosis and test switch terminal)
11. Battery
12. A/C SV valve

CONTROL DEVICES
a : Fuel injector
b : IAC valve
c : Fuel pump relay
d : EGR SV valve
e : Air bypass SV valve

OTHERS
A : ECM
B : ECM main relay
C : Master cylinder
D : Catalyst case
E : Differential

WIRINIG DIAGRAM



1. ECM
2. Distributor (CMP sensor)
3. MAP sensor
4. TP switch
5. Monitor coupler
6. VSS
7. A/C SV valve
8. A/C controller
9. CO resistor
10. IAT sensor
11. ECT sensor
12. Oxygen sensor
13. Electric load
14. Battery
15. Fuse
16. Main relay
17. Engine ground
18. Ignition coil
19. To distributor
20. Engine ground
21. Injector
22. Injector
23. Air bypass SV valve
24. EGR SV valve
25. Fuel pump relay
26. To fuel pump
27. IAC valve
28. Turbocharger indicator light
29. Malfunction indicator lamp
30. Engine ground

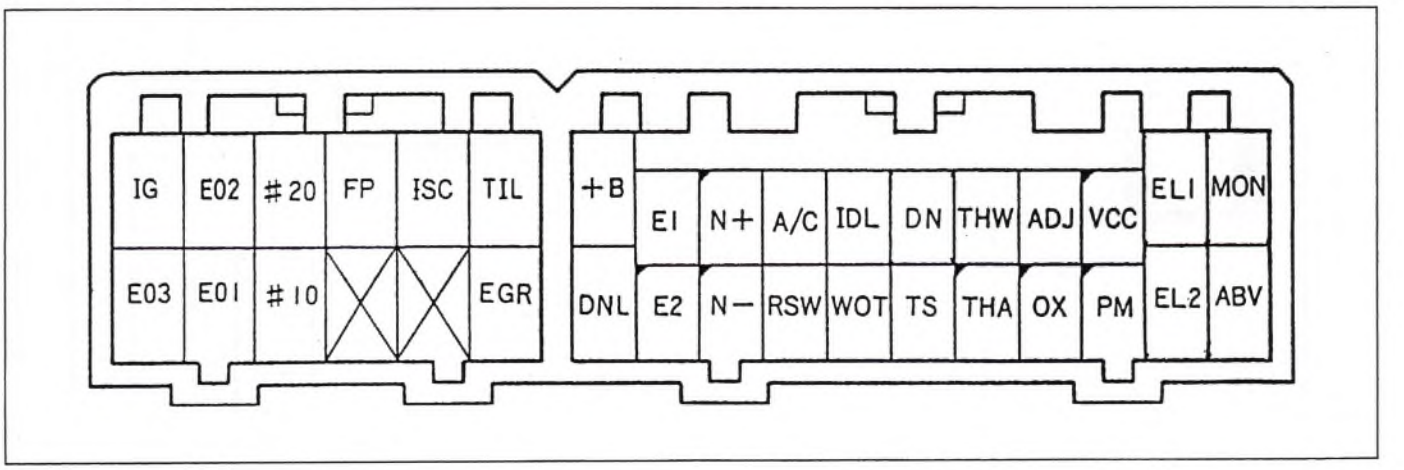
+B : From battery +
IG. SW: From ignition switch

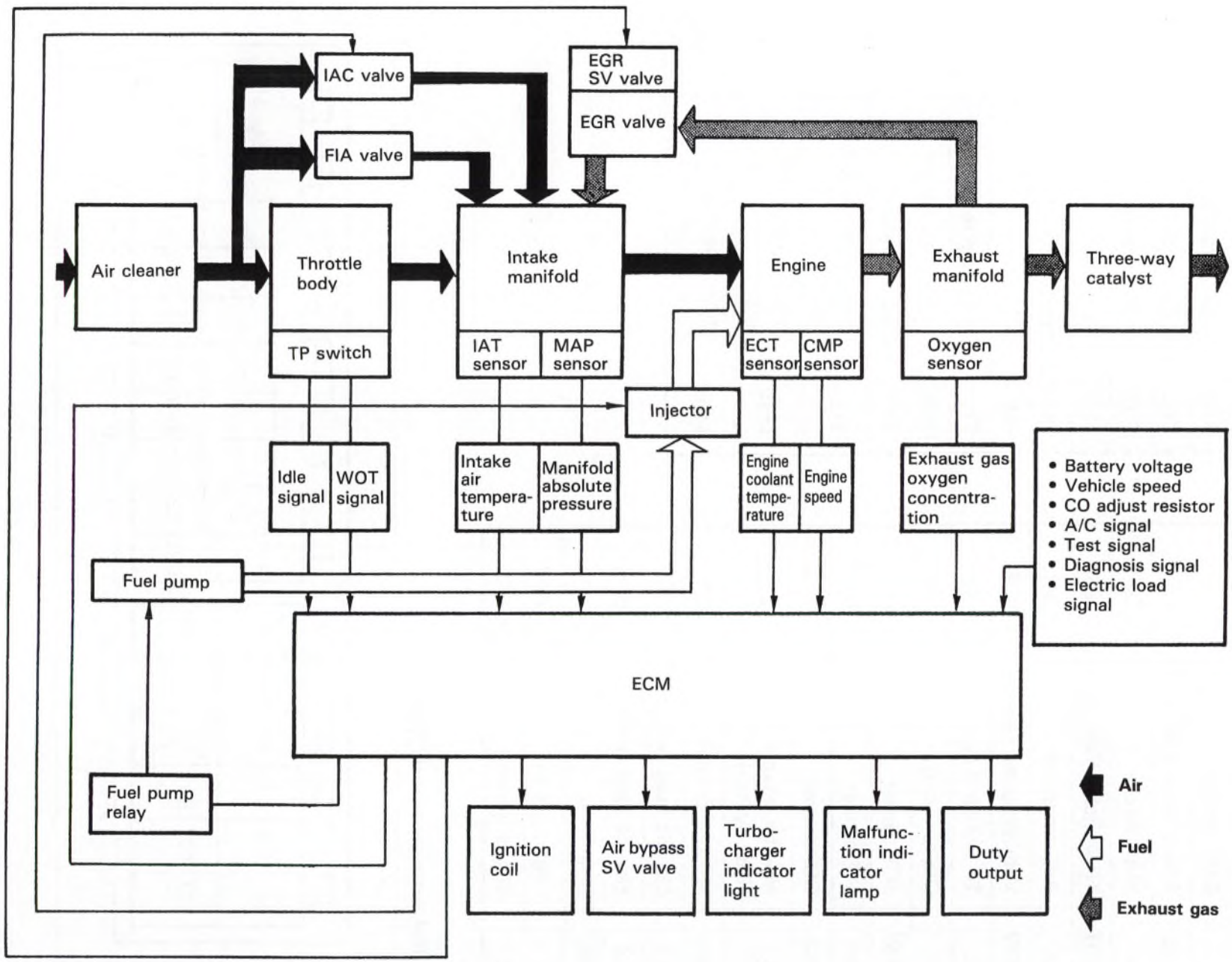
ECM Connecter Terminals

Terminal	Circuit	Wire color
N+	CMP sensor +	O
N−	CMP sensor −	W
VCC	Power source of sensor	Lg/R
PM	MAP sensor	Lg/Y
WOT	TP switch (Wide open)	Lbl
A/C	A/C controller	Bl/G
RSW	Vehicle speed sensor	V/R
IDL	TP switch (Idle)	Gr
OX	Oxygen sensor	W
THW	ECT sensor	Lg/W
THA	IAT sensor	Lg/B
ADJ	CO resistor	Gr/W
TS	Monitor coupler (Test switch)	P/W
DN	Monitor coupler	V/G
EL1	Electric load switch	P/B
EL2	Electric load switch	Br/R
+B	Main relay	B/R
E1	Engine ground	Bl/B
E2	Sensor ground	B/G

Terminal	Circuit	Wire color
IG	Ignition coil	Br/W
E01	Engine ground	B/Bl
E02	Engine ground	B/Bl
E03	Engine ground	B/Y
#10	Injector	Bl/R
#20	Injector	Bl
ISC	IAC valve	O
FP	Fuel pump relay	Br/B
ABV	Air bypoass SV valve	O/G
EGR	EGR SV valve	O/W
TIL	Turbocharger indicator light	Lg
DNL	Malfunction indicator lamp	V/Y
MON	Monitor coupler (duty output terminal)	B/O

Terminal Arrangement (ECM side)

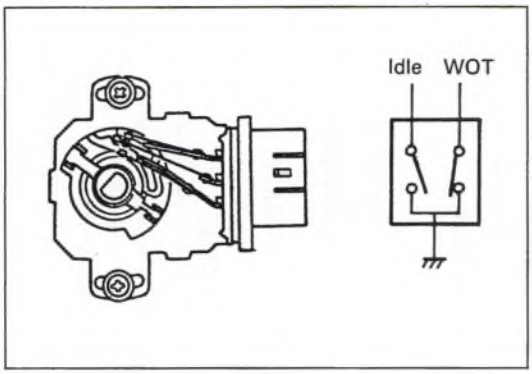



IAC valve
FIA valve
EGR SV valve
EGR valve
Air cleaner
Throttle body
TP switch
Intake manifold
IAT sensor
MAP sensor
Engine
ECT sensor
CMP sensor
Exhaust manifold
Oxygen sensor
Three-way catalyst
Injector
Idle signal
WOT signal
Intake air temperature
Manifold absolute pressure
Engine coolant temperature
Engine speed
Exhaust gas oxygen concentration
• Battery voltage
• Vehicle speed
• CO adjust resistor
• A/C signal
• Test signal
• Diagnosis signal
• Electric load signal
Fuel pump
ECM
Fuel pump relay
Ignition coil
Air bypass SV valve
Turbo-charger indicator light
Malfunction indicator lamp
Duty output
Air
Fuel
Exhaust gas

INPUT-TO-OUTPUT TABLE

(○ = Used signal)

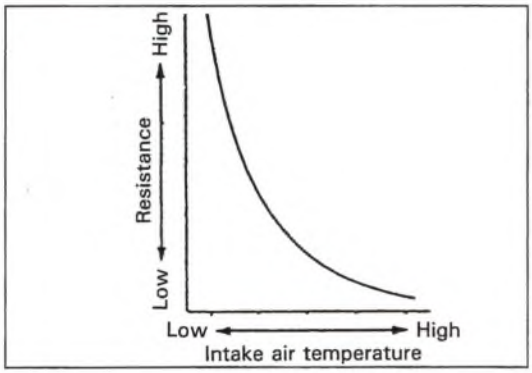
Item	Information sensors (Input) / Control devices (Output)	CMP sensor	MAP sensor	TP switch		Vehicle speed sensor	ECT sensor	IAT sensor	Oxygen sensor	CO adjust resistor	Battery voltage	A/C signal	Electric load signal	Test switch	Diagnosis switch
				Idle	WOT										
Fuel injection control	Injector	○	○	○	○	○	○	○	○	○	○				
Idle speed control	IAC valve	○		○	○		○					○	○		
Fuel pump control	Fuel pump	○									○				
Turbocharger indicator light control	Turbocharger indicator light		○												
Maximum speed control	Injector					○									
Ignition timing control	Ignition coil	○	○	○			○	○						○	
EGR control	EGR SV valve	○	○				○								
Air bypass valve control	Air bypass SV valve	○	○	○		○	○								
Self diagnosis function	Malfunction indicator lamp	○	○	○	○	○	○	○	○			○			○
Duty out put (A/F or IAC duty)	Duty out put terminal								○					○	○



Throttle Position Switch (TP Switch)

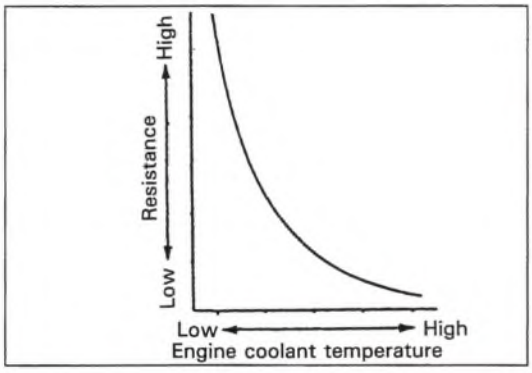
The TP switch is installed to the throttle body. It has two contact points: the idle switch (Idle) and the wide open throttle switch (WOT). The contact point of the idle switch closes when the throttle opening is 1.5° or less, thereby the idle condition is detected.

The contact point of WOT closes when the throttle opening is 60° or more, thereby the wide open condition is detected.



Intake Air Temperature Sensor (IAT Sensor)

Located on the intake manifold, this sensor constantly measures the temperature of the air entering there and converts a change in the air temperature into that in resistance through its thermistor. That is, as air temperature lowers, resistance increases and as it rises, resistance decreases. As air density of the intake air varies with variation in temperature, ECM, by monitoring the resistance, adjusts the amount of fuel injection according to the air temperature.

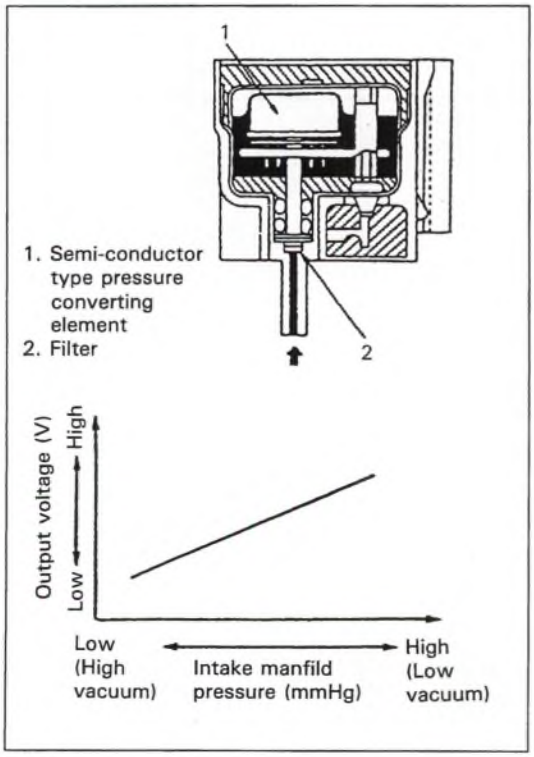


Engine Coolant Temperature Sensor (ECT Sensor)

Located on the intake manifold, this sensor measures the temperature of the engine coolant and converts its change into that in resistance through the thermistor like the air temperature sensor.

That is, as coolant temperature lowers, resistance increases and as it rises, resistance decreases.

By monitoring the resistance of the coolant temperature sensor, ECM detects the engine coolant temperature and that affects most systems under the control of ECM.

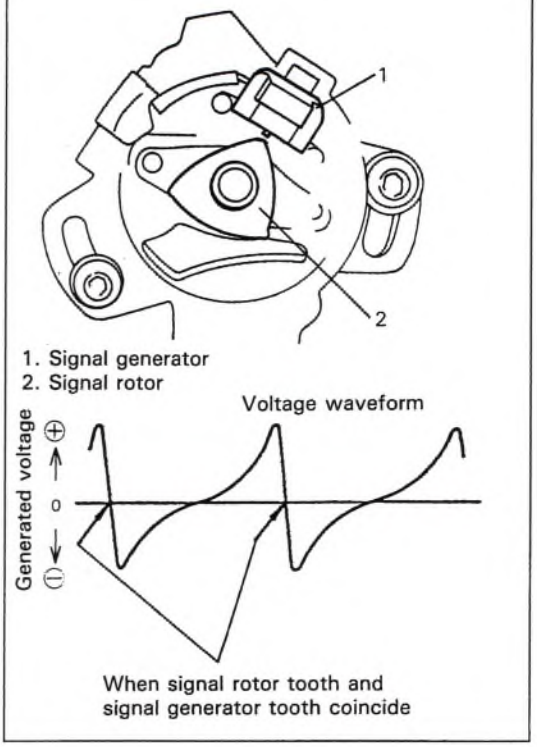


Manifold Absolute Pressure Sensor (MAP Sensor)

This sensor senses pressure change in the intake manifold and converts it into voltage change. It consists of a semiconductor type pressure converting element which converts a pressure change into an electrical change and an electronic circuit which amplifies and corrects the electric change. The ECM sends a 5-volt reference voltage to the pressure sensor. As the manifold pressure changes, the electrical resistance of the sensor also changes.

By monitoring the sensor output voltage, ECM knows the manifold pressure (intake air volume).

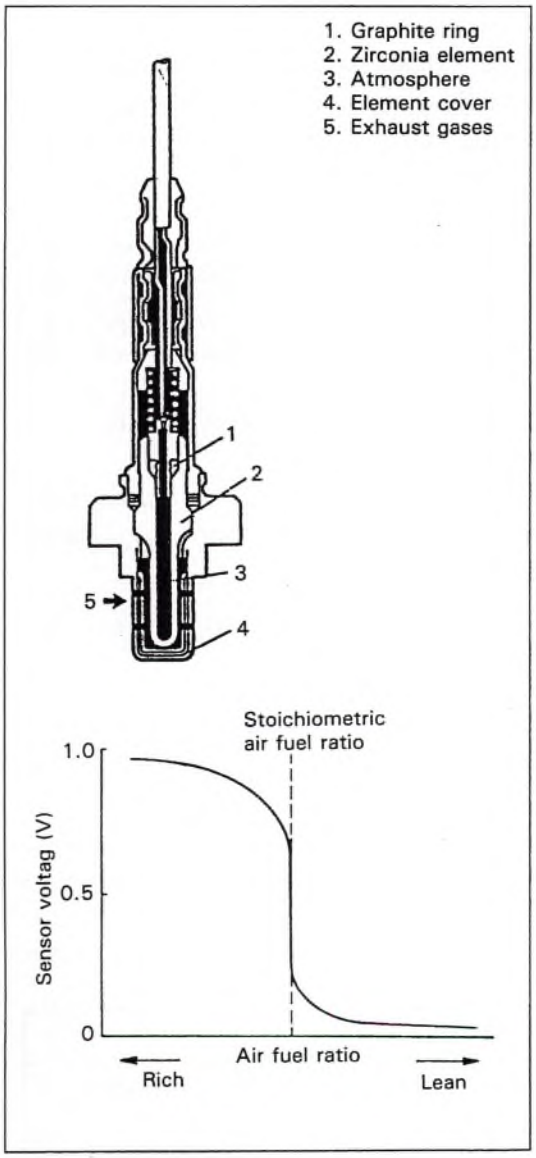
ECM uses the voltage signal from the pressure sensor as one of the signals to control fuel injector, idle air control valve and EGR SV valve.



Camshaft Position Sensor (CMP Sensor)

The camshaft position sensor located in the distributor consists of the signal generator (pick-up coil and magnet) and signal rotor.

As the signal rotor turns, AC voltage is generated in the pick-up coil which varies in pulsatory way as shown. This pulse signal (3 pulses/revolution) is sent to ECM where it is used to calculate the engine speed and also as one of the signals to control various devices.



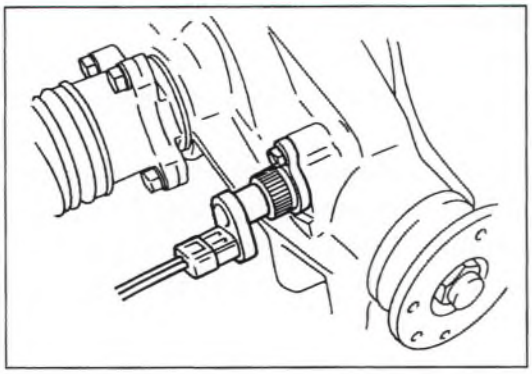
Oxygen Sensor

The oxygen sensor is located on the turbocharger pipe to detect the concentration of oxygen in the exhaust gases. It consists of the zirconia element (with thin platinum surface coating) which generates electromotive force, lead wire which draws out the electromotive force, lead wire which draws out the electromotive force and cover and housing which protect the zirconia element from damage.

The zirconia element, by its property, generates the electromotive force when a difference in oxygen concentration exists between its faces. As its temperature rises, the change of the electromotive force is amplified by catalytic reaction of the platinum. The oxygen sensor makes use of this property. As atmosphere is introduced into the oxygen sensor, the inside of the zirconia element is exposed to the atmosphere and outside to exhaust gases. Thus the difference in concentration between the inside and the outside of the zirconia element varies with the oxygen concentration in the exhaust gases.

The large concentration difference results in about 1V of the electromotive force and small difference results in about 0V. To put in other words, if the amount of oxygen in the exhaust gases is less (air-fuel mixture is richer than the stoichiometric mixture), about 1V of electromotive force is generated and if more (air-fuel mixture is leaner than the stoichiometric mixture), almost none is generated.

In this way, the oxygen sensor detects whether the oxygen concentration is high or low (or the mixture is leaner or richer than the stoichiometric mixture).



Vehicle Speed Sensor

The vehicle speed sensor is installed to the differential. It feeds number of revolutions of the speed meter driven gear to ECM as pulse signals.

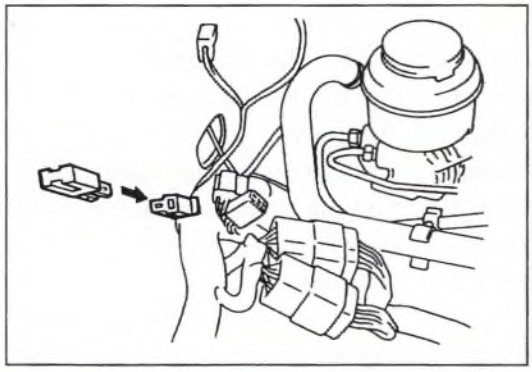
Sensor speed: 637 r/min = Vehicle speed: 60 km/h

Battery Voltage

The fuel injector is driven by its solenoid coil based upon the ECM output signal.

There is some delay called as "Ineffective injection time", which doesn't provide fuel, between ECM signal and valve action.

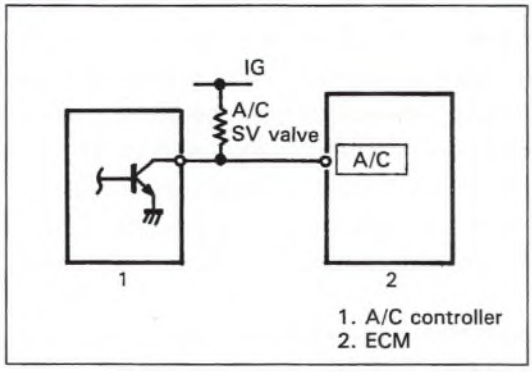
As the ineffective injection time depends on the battery voltage, ECM takes voltage information to compensate it in fuel injection time.



CO Resistor

Located at the right of the dash panel in the engine room, this resistor makes fine adjustment of CO concentration according to each resistance value. As there are 8 resistance values in all, adjustment is possible in 9 steps including "no resistance".

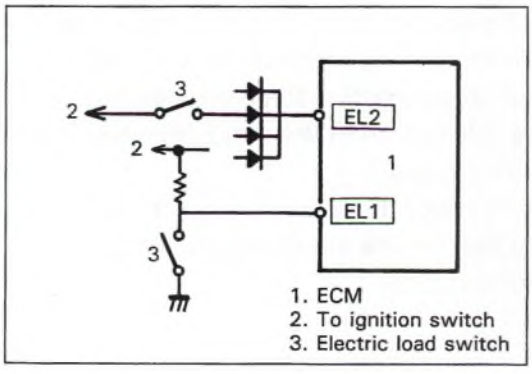
Mark	R3	R2	R1	L1	L2	L3	L4	L5
Resistance	2.2k	1.5k	1.0k	680	430	270	160	82



Air Conditioning (A/C) Signal (Vehicle with A/C only)

This signal is sent from the A/C circuit.

ECM detects whether the A/C is operating or not through the signal and uses it as one of the signals for controlling idle air control valve operation.

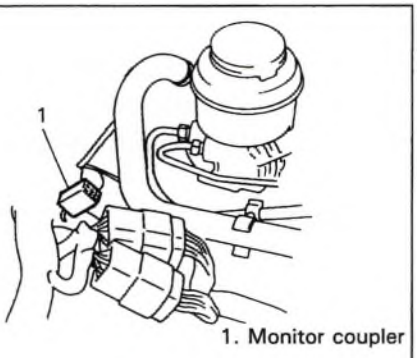


Electric Load Signal

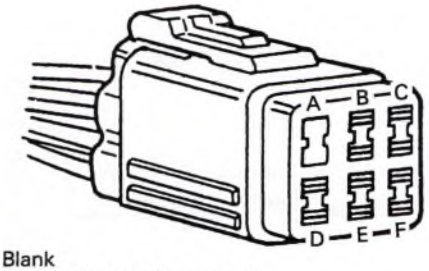
This signal is sent from each circuit of head & small (or clearance) lights, heater fan, radiator fan and rear window defogger.

ECM uses it as one of the factors for controlling idle air control valve operation.

EL1 terminal	Blower fan
EL2 terminal	Radiator fan, Rear window defogger, Small (or clearance) lights



1. Monitor coupler



A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

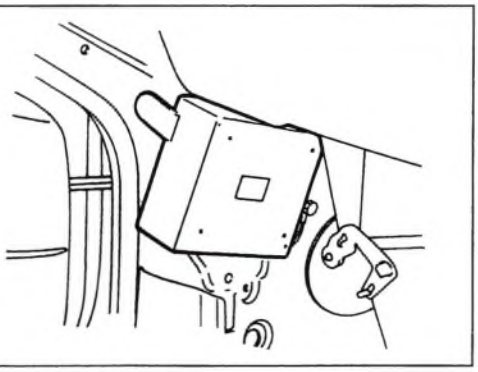
Diagnosis Switch Terminal

There are two diagnosis switch terminals; one included in the junction/fuse block and the other in the monitor coupler in the engine room. When either diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs diagnostic trouble code and at the same time outputs idle air control duty through duty output terminal.

Test Switch Terminal

The test switch terminal is included in the monitor coupler. When this terminal is grounded, ECM sets the ignition timing to the initial ignition timing.

When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the duty output terminal.



Engine Control Module (ECM)

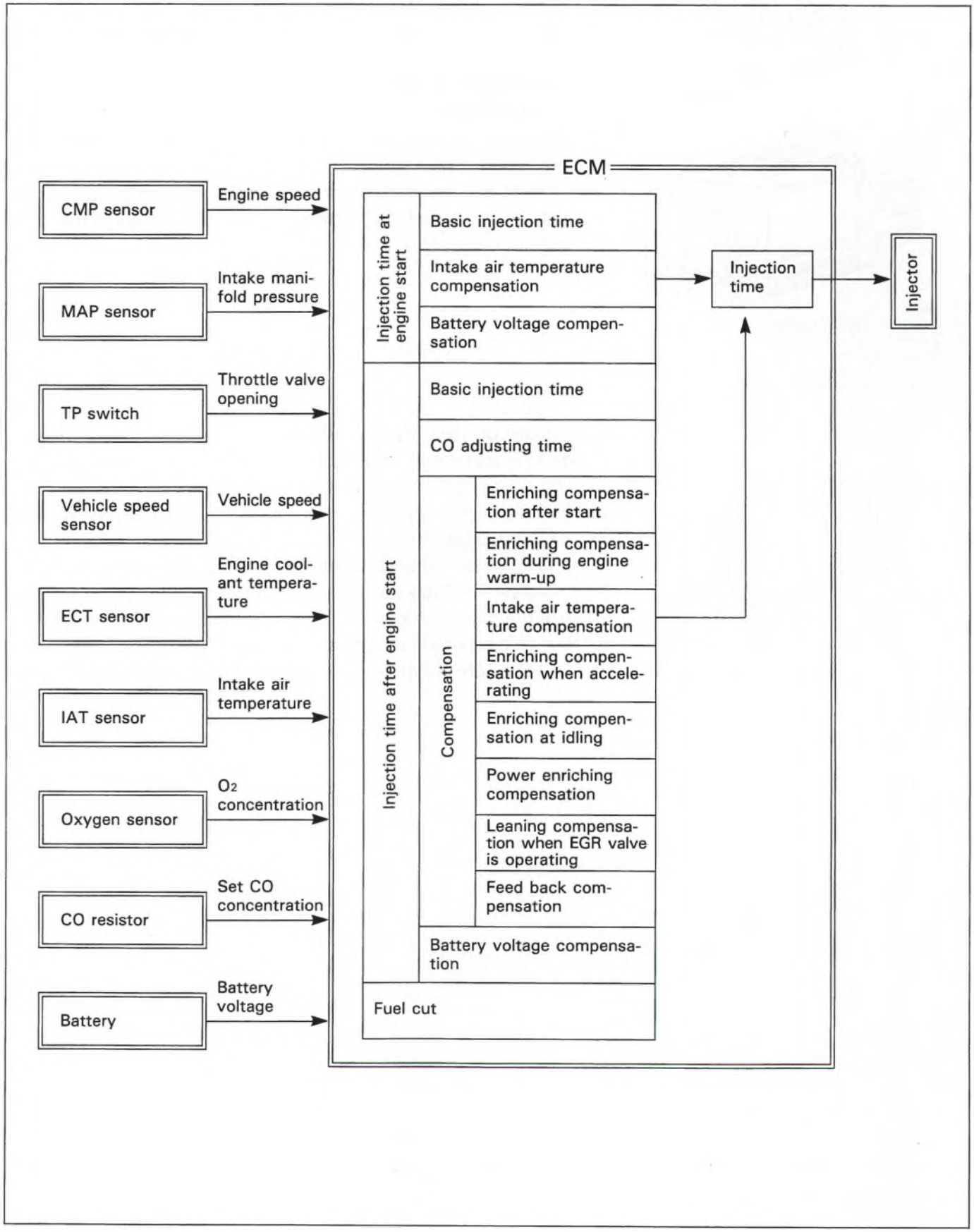
ECM is installed to the underside of the instrument panel at the passenger's seat side.

ECM is a precision unit consisting of microcomputer, A/D (Analog/Digital) converter, I/O (Input/Output) unit, etc..

It is an essential part of the electronic control system, for its functions include not only such a major function as to control fuel injector, idle air control valve, fuel pump relay, etc. but also on-board diagnostic system (self-diagnosis function) and fail-safe function as described in the following section.

INJECTION TIMING (AMOUNT OF INJECTION)

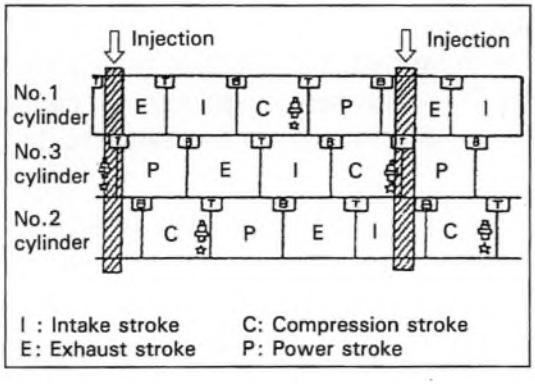
The factors to determine the injection time are the basis injection time which is calculated on the basis of the engine speed and the intake manifold pressure (amount of the intake air) and various compensations which are determined according to the signals from various sensors that detect the state of the engine and driving conditions.



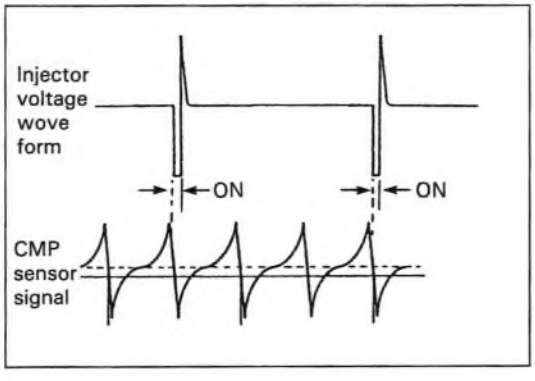
Fuel Injection Control System

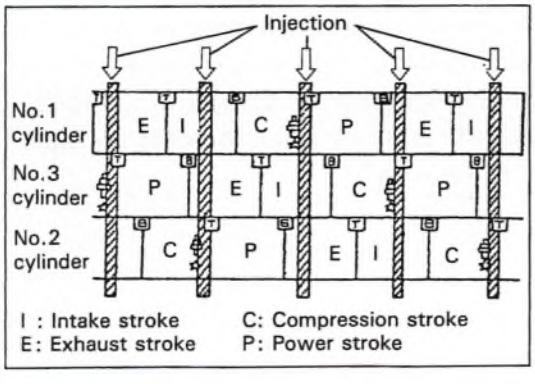
In this system, ECM controls the time (amount) and timing of the fuel injection from the fuel injector into the cylinder head intake port according to the signals from the various sensors so that suitable air/fuel mixture is supplied to the engine in each driving condition.

There are two types of injection timing. One is "synchronous injection" in which injection is synchronous with the camshaft position sensor (CMP sensor) signal and the other is "asynchronous injection" in which injection takes place independently of the CMP sensor signal.

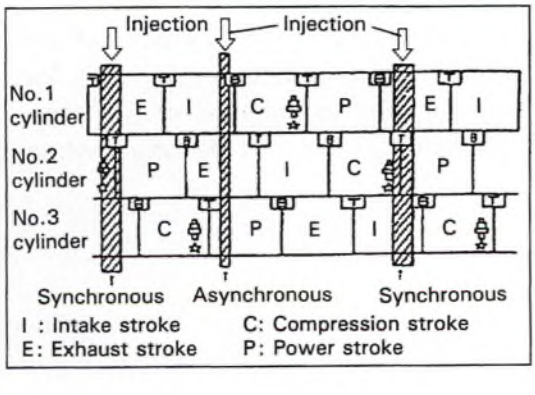


- **Basic injection (Synchronous injection)**
 All three injectors inject fuel simultaneously and synchronously at every three CMP sensor signals, that is, twice every crankshaft turn.

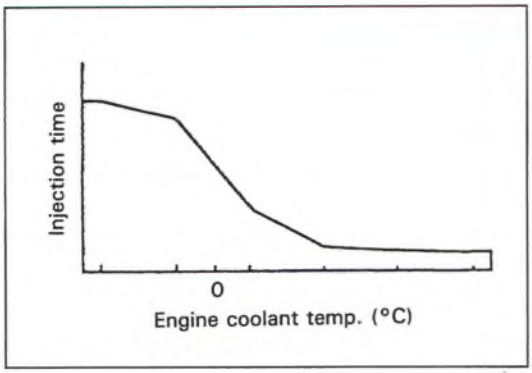




- **Synchronous injection at start**
 When the engine is cranking, all three injectors start injecting the fuel simultaneously at every CMP sensor signal (ignition signal).



- **Asynchronous injection**
 When the throttle valve is opened from its idle position, the injector injects fuel in addition to synchronous injection independently of the CMP sensor signal.



Synchronous Injection Time

Injection time at engine start

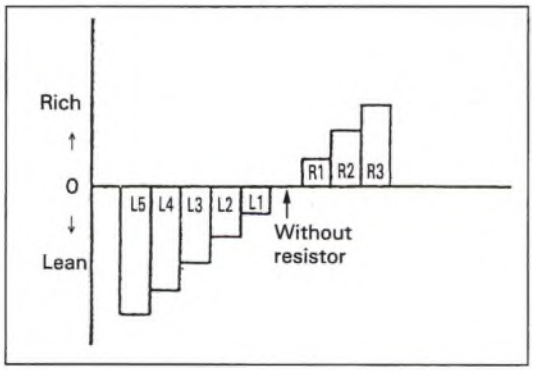
When starting the engine, the injection time is determined by adding intake air temperature compensation and voltage compensation to the basic injection time determined by the engine coolant temperature regardless of the manifold absolute pressure.

Injection time after starting

After the engine has been started, the injection time is determined by adding the CO adjustment injection time, compensation from each sensor and voltage compensation to the basic injection time.

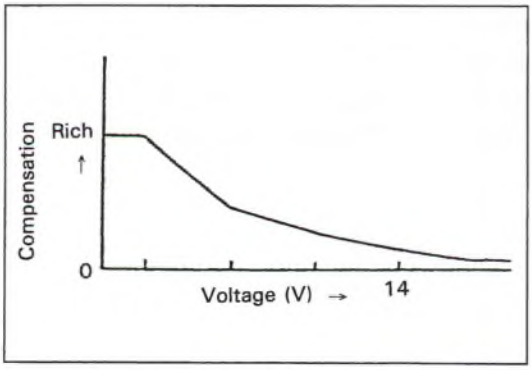
Basic injection time

The basic injection time is determined on the basis of the engine speed signal from the CMP sensor and the manifold vacuum from the MAP sensor.



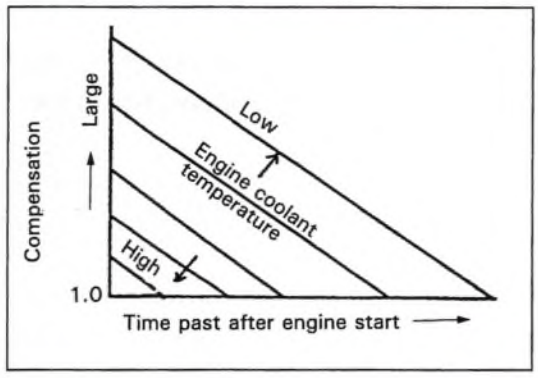
Base air/fuel ratio compensation by CO resistors

Variation of the base air/fuel ratio due to such factors of the engine as aging can be adjusted by replacing the CO resistor. As there are 8 types of resistors, adjustment is possible in 9 steps including "no resistor".



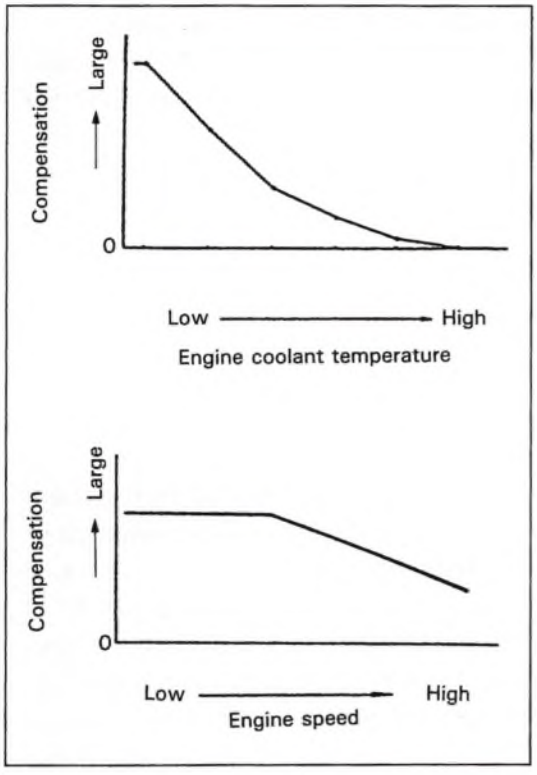
Battery voltage compensation

A power voltage drop delays the mechanical operation of the injector. Then the actual injection time becomes shorter for the time that electricity is supplied to the injector. To compensate this, the electricity supply time is made longer when the voltage is lower.



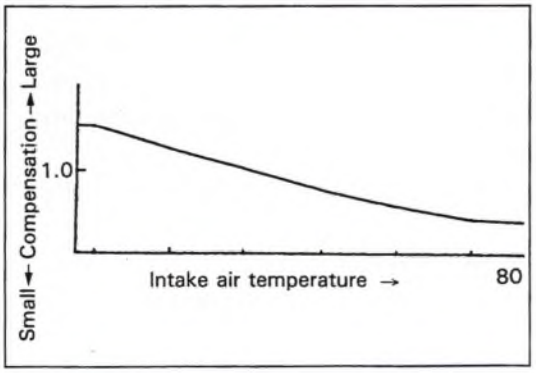
Enriching compensation after engine start

For a certain time after the engine is started, air/fuel mixture enriching compensation is made so as to stabilize the engine speed. The amount of compensation varies depending on the engine coolant temperature.



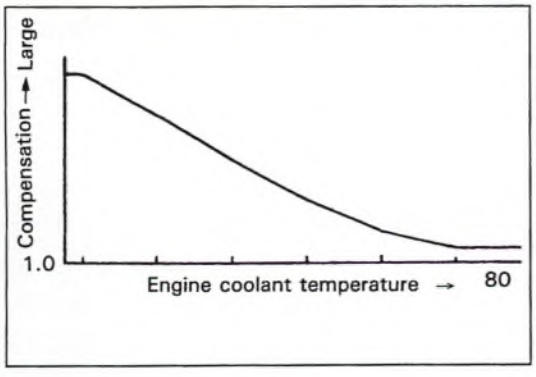
Enriching compensation while warming up

When the engine is cold, enriching compensation is made to ensure good driveability till the engine coolant temperature reaches the specified level.



Intake air temperature compensation

As the intake air volume varies with the temperature, it is compensated for its temperature.



Enriching compensation when accelerating

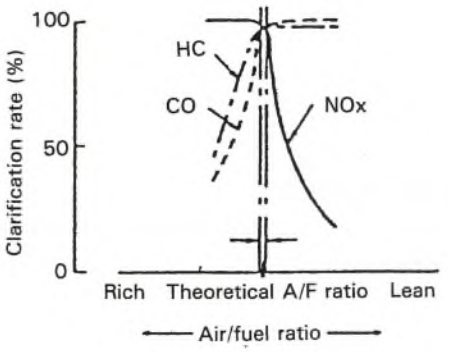
To ensure smooth acceleration, enriching compensation is carried out when the intake manifold pressure varies by more than a specified amount during acceleration. The amount of compensation is determined according to the engine coolant temperature and how much the intake manifold pressure varies.

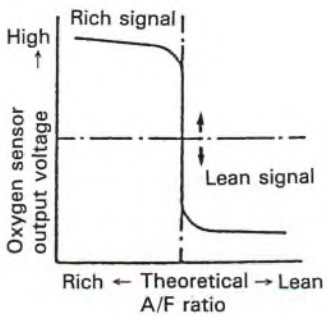
Power enriching compensation

To ensure smooth acceleration and good driveability under the high load driving condition, enriching compensation is carried out.

Leaning compensation when EGR valve is operating

To ensure proper air/fuel mixture ratio even while EGR valve is open, leaning compensation is carried out when EGR SV valve is ON.

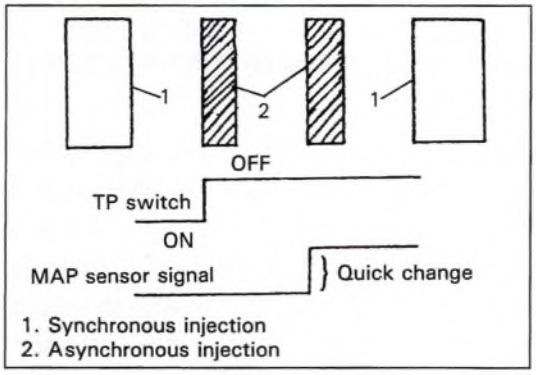




Air/fuel ratio feed back compensation (Closed loop system)

It is necessary to keep the air/fuel mixture close to the theoretical air/fuel ratio (14.7) to obtain efficient performance of the 3-way catalytic converter and high clarification rate of CO, HC and NOx in the exhaust gas. For that purpose, ECM operates as follows. It first compares the signal from the oxygen sensor with a specified reference voltage and if the signal is higher, it detects that the air/fuel ratio is richer than the theoretical air/fuel ratio and reduces fuel. On the other hand, if the signal is lower, it detects that the air/fuel ratio is leaner and increases fuel. By repeating these operations, it adjusts the air/fuel ratio closer to the theoretical air/fuel ratio. This control process, however, will not take place under any of the following conditions.

- At engine start and when fuel injection is increased after engine start
- When engine coolant temperature is low
- When highly loaded and fuel injection is increased
- At fuel cut
- When oxygen sensor is cold
- When engine is running at high speed (higher than about 4400 r/min).



1. Synchronous injection
2. Asynchronous injection

Asynchronous Injection Timing

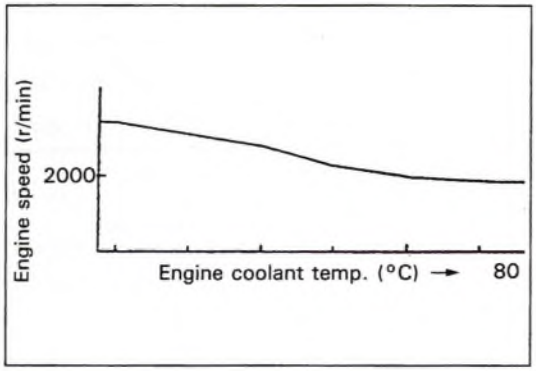
Separately from the synchronous injection (normal injection), injection occurs immediately when signals form each sensor meet following conditions.

During acceleration

When the idle switch turns ON from OFF, and also when a large change in the manifold pressure follows, asynchronous injection occurs.

When ruturning from fuel-cut

When normal fuel injection is restored from the fuel-cut state, if the engine speed drops by a large extent, asynchronous increased injection compensation occurs to prevent engine from stalling.



Fuel-Cut

Fuel-cut during deceleration

When the engine speed is high and the idle switch is ON (during deceleration), fuel injection is stopped to prevent unnecessary burning.

When the engine speed drops to a specified value or lower, fuel injection is restarted. The specified engine speed for fuel-cut varies according to the engine coolant temeprature.

High speed fuel-cut

To prevent the engine from overrunning, fuel injection is stopped when the engine speed exceeds the specified level. Also when the engine speed over 8800 rpm continues for longer than 3 seconds, fuel injection is stopped.

Overrun preventive engine speed (rpm)	Cut	9300
	Restored	9100

Fuel-cut at high supercharging pressure

When turbo supercharging pressure exceeds the specified value, fuel injection is stopped.

Fuel cut supercharging pressure (mmHg)	Cut	1606
	Restored	1497

IDLE AIR CONTROL SYSTEM

This system controls the bypass air flow by means of ECM and idle air control valve (IAC valve) for the following three purposes.

- To keep the engine idle speed as specified at all times
 The engine idle speed can vary due to following reasons.
 * Load applied to engine (when electric load is applied, A/C is turned ON, etc.)
 * Variation in atmospheric pressure
 * Change in engine itself with passage of time
 * Other factors causing idle speed to change
- To improve starting performance of engine
- To compensate air/fuel mixture ratio when decelerating (Dash-pot effect)

Operation

IAC valve opens the bypass air passage when it is turned ON by ECM and closes it when turned OFF.

ECM detects the engine condition by using signals from various sensors and switches and while repeating ON and OFF cycle of IAC valve at a certain rate (15 times a second), it controls bypass air flow by increasing and decreasing its ON time within a cycle.

While the engine is cranking, ECM keeps IAC valve ON so as to obtain better start of the engine. After the engine has started, it reduces ON time gradually to maintain the idle speed as specified.

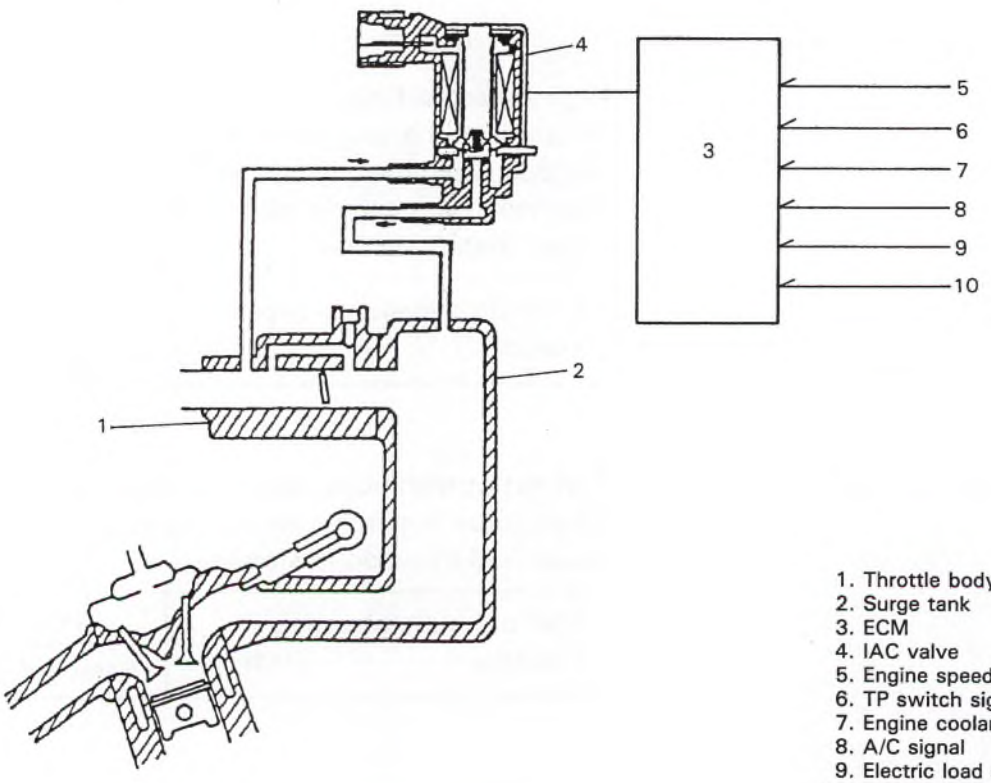
When the accelerator pedal is depressed (throttle valve is at other than idle position), ECM keeps IAC valve ON. When decelerating, on the other hand, it reduces its ON time gradually (thereby reducing the bypass air flow gradually) to adjust air/fuel mixture to an optimum ratio for combustion.

When the vehicle is at a stop, the throttle valve is at the idle position and the engine is running, ECM controls the bypass air flow by increasing or decreasing ON time of IAC valve so that the engine speed is kept at a specified idle speed.

With an A/C equipped vehicle, when the A/C is ON, a certain amount of the bypass air is supplied by the A/C SV valve independently of this system. The bypass air supplied by this system is used for fine control to keep the idle speed as specified. Engine idle speed specifications at engine normal operating temperature are as follows.

Specified idle speed (Unit: r/min)

A/C OFF	A/C ON
950 ± 50	1050 ± 50

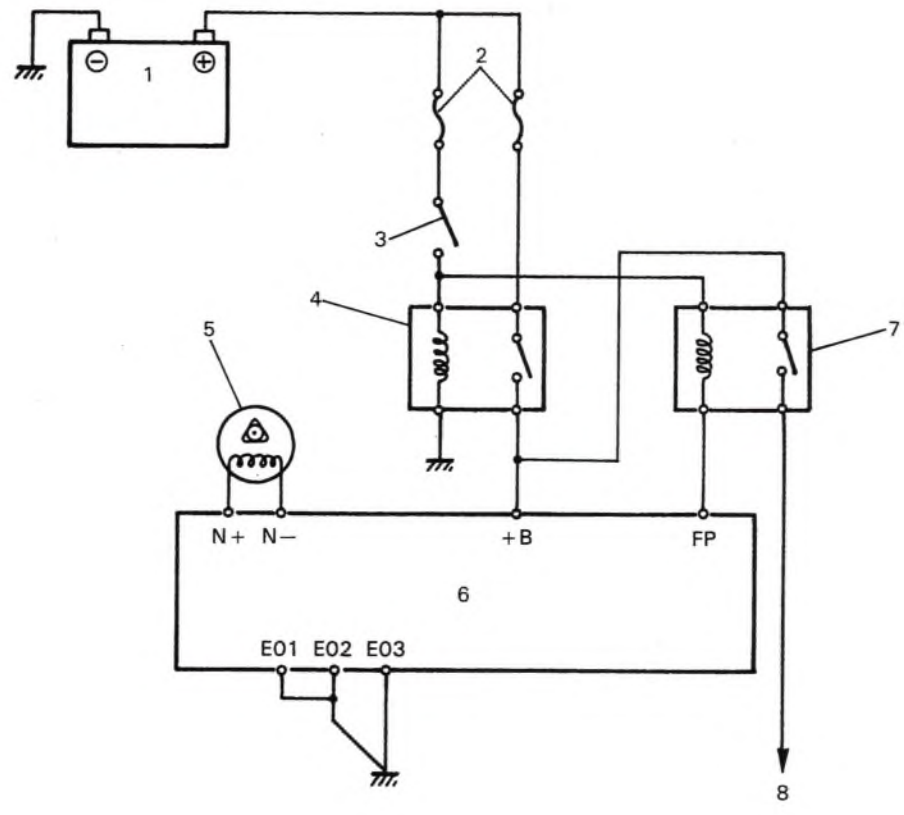


1. Throttle body
2. Surge tank
3. ECM
4. IAC valve
5. Engine speed
6. TP switch signal (Idle/WOT)
7. Engine coolant temperature
8. A/C signal
9. Electric load signal diode
10. Diagnosis switch

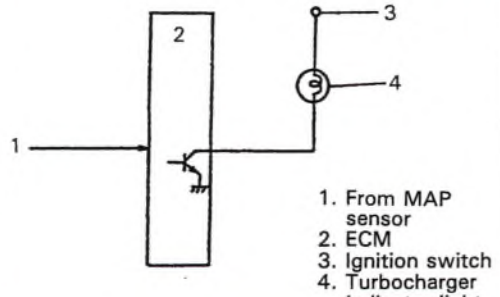
FUEL PUMP CONTROL SYSTEM

ECM controls ON/OFF operation of the fuel pump by turning it ON via the fuel pump relay under any of the following conditions.

- For 5 seconds after ignition switch ON.
- While camshaft position sensor (CMP sensor) signal is inputted to ECM.



1. Battery
2. Fuse
3. Ignition switch
4. ECM main relay
5. CMP sensor
6. ECM
7. Fuel pump relay
8. To fuel pump

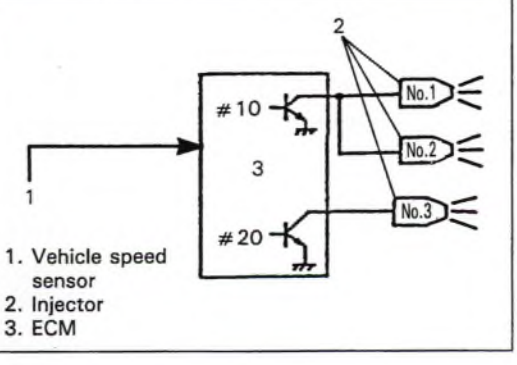


1. From MAP sensor
2. ECM
3. Ignition switch
4. Turbocharger indicator light

TURBOCHARGER INDICATOR LIGHT CONTROL SYSTEM

When the manifold vacuum exceeds the specified value, the turbocharger indicator light turns ON. It also lights for about 0.3 seconds after the ignition switch was turned ON for the purpose of light check.

Manifold pressure (mmHg)	Light ON	800
	Light OFF	740



1. Vehicle speed sensor
2. Injector
3. ECM

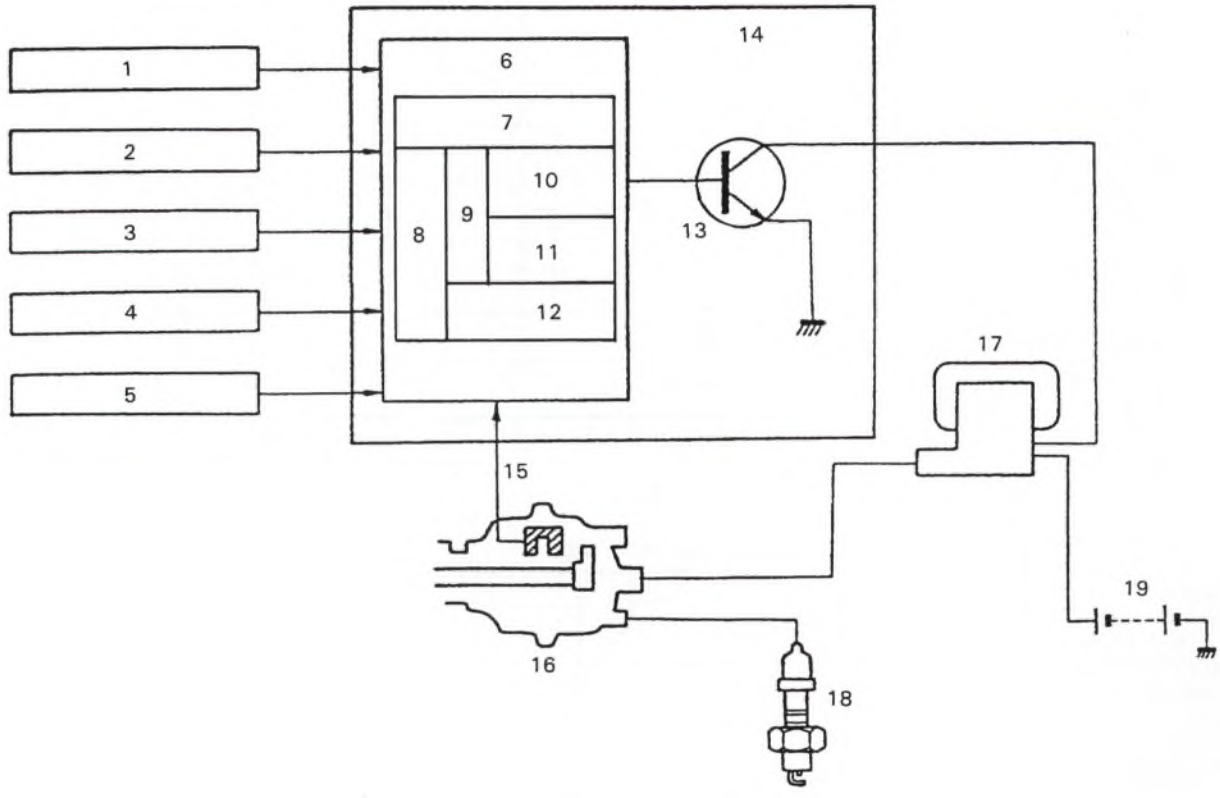
MAXIMUM SPEED CONTROL SYSTEM

When the vehicle speed exceeds 130 km/h (4000 rpm by engine speed), fuel injection of # 10 (1st and 2nd cylinders) injector is stopped once every 2 times to prevent it from exceeding 140 km/h.

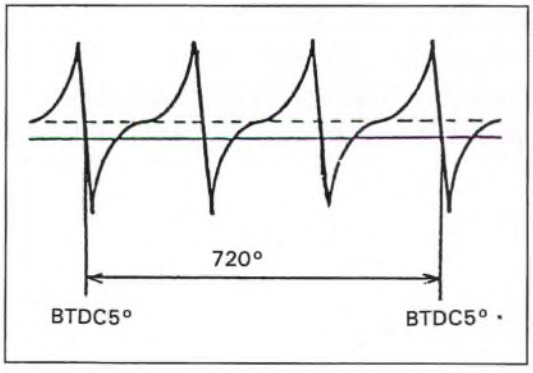
ELECTRONIC SPARK ADVANCE (ESA) SYSTEM

This system controls electronically the time of electric current flow to ignition primary coil as well as ignition timing.

ECM judges the engine condition by using signals from various sensors, selects the most suitable electric current flow time and ignition timing for that engine condition from among those prestored in its memory and turns ON and OFF the primary currrent of the ignition coil.



1. MAP sensor
2. TP switch
3. ECT sensor
4. Power supply
5. Test switch
6. ESA controller
7. Initial ignition timing
8. Advanced ignition timing
9. Ignition timing control
10. Base spark advance
11. Spark advance compensation
12. Electric current flow time
13. Power transistor
14. ECM
15. CMP sensor
16. Distributor
17. Ignition coil
18. Spark plug
19. Battery



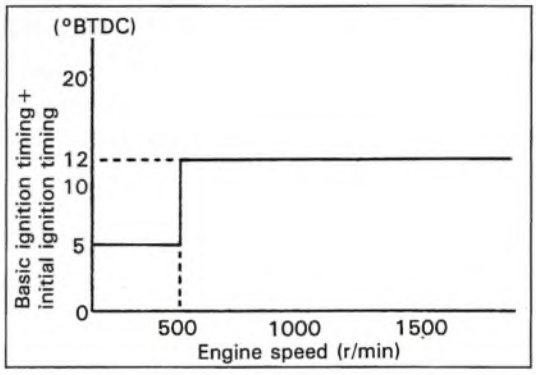
Ignition Timing Control at Engine Start

To obtain better starting performance of the engine at the engine start (when the engine speed is lower than 500 r/min.), ESA system sets the ignition timing to the initial ignition timing (5° BTDC.)

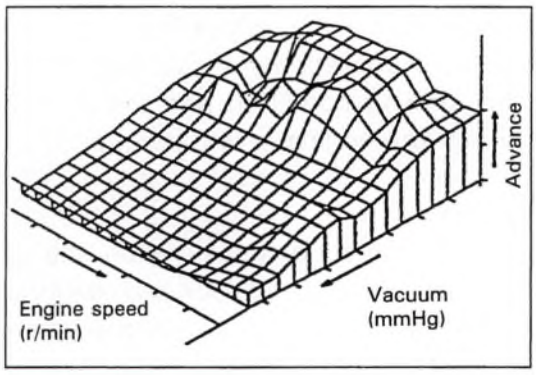
Ignition Timing Control After Engine Start

The ignition timing after the engine start is determined as follows so that the spark occurs at the most suitable timing for each engine condition.

Ignition timing	=	Initial ignition timing	+	Basic ignition advance	+	Various compensating advance



When the idle switch is ON, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed to the initial ignition timing.

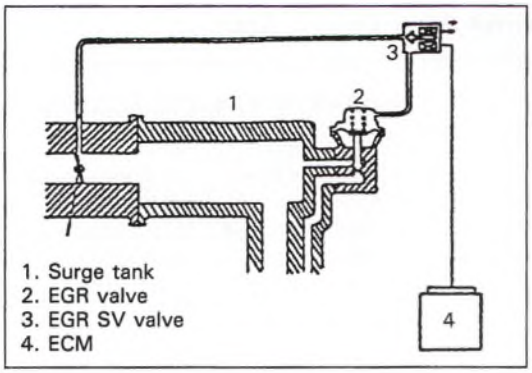


When the idle switch is OFF, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed and intake manifold pressure and coolant temperature compensating advance to the initial ignition timing.

- **Coolant temperature compensating advance**
 This compensation is added according to the signal from the engine coolant temperature sensor which detects the engine coolant temperature.

- **Electric current flow time control**
 To stabilize the secondary voltage generated in the ignition coil to a proper level, ESA system controls the time of primary current flow to the ignition coil.

 NOTE:
 The ignition timing is controlled by ECM as described above. Therefore, when checking or adjusting the ignition timing, the ignition timing must be fixed to the initial one by grounding the test switch terminal.

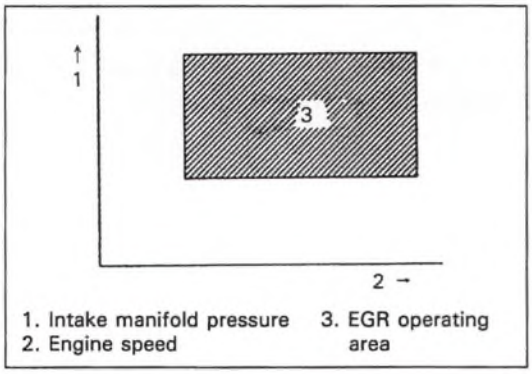


1. Surge tank
2. EGR valve
3. EGR SV valve
4. ECM

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.

The EGR valve is controlled by EGR SV valve controlled by ECM according to signals from various sensors.



1. Intake manifold pressure
2. Engine speed
3. EGR operating area

Under any one of the following conditions, ECM closes the vacuum passage of SV valve. In this state, as the vacuum is not transmitted to the EGR valve, it remains closed.

- When engine coolant temp. is lower than 40°C.
- When engine is running under high load.

AIR BYPASS VALVE (ABV) CONTROL SYSTEM

This system controls ON/OFF operation of the air bypass SV valve according to the running condition and the engine coolant temperature when the engine is warmed up.

Control During Deceleration

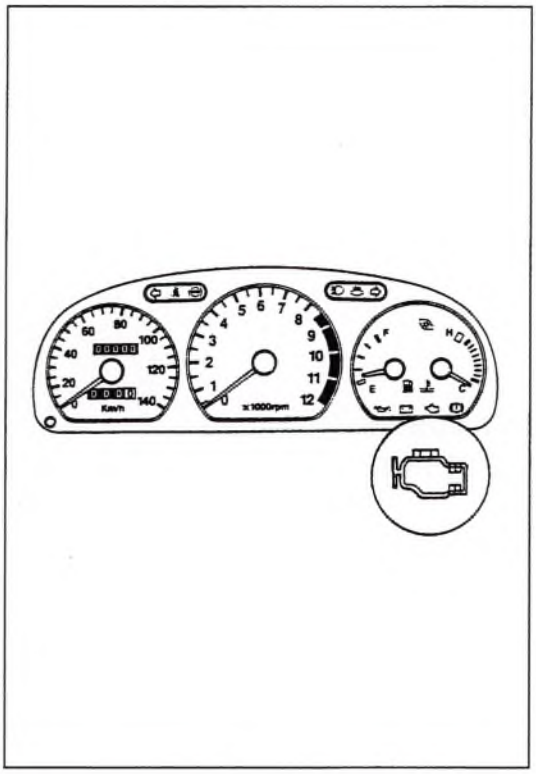
When the throttle valve is closed during deceleration, the air overcharged by the turbocharger is forced back and air vibration and pulse sound occur. To prevent this, during deceleration, the SV valve is turned ON to open the air bypass valve so that the overcharged pressure is relieved.

Maximum Speed Control

When the vehicle speed exceeds 140 km/h while running at 4000 rpm or higher engine speed, the SV valve turns ON to open the air bypass valve to relieve the overcharged pressure before the turbocharger, controlling the vehicle speed.

Fast Idle Control

During fast idle, overcharging occurs to cause the engine speed to increase abnormally. To prevent this, the SV valve is turned ON to open the air bypass valve to that the overcharged pressure is relieved.



ON-BOARD DIAGNOSTIC SYSTEM (SELF-DIAGNOSIS FUNCTION)

ECM diagnoses troubles which may occur in the area including the following parts when the ignition switch is ON and the engine is running, and indicates the result by turning on or flashing malfunction indicator lamp.

- Oxygen sensor
- Engine coolant temp. sensor
- Throttle position switch
- Vehicle speed sensor
- Intake air temp. sensor
- Ignition signal
- Camshaft position sensor
- Manifold absolute pressure sensor
- CPU (Central Processing Unit) of ECM

ECM and malfunction indicator lamp operate as follows.

- Malfunction indicator lamp lights when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Electronic Fuel Injection system. This is only to check the malfunction indicator lamp bulb and its circuit.
- If the above areas of Electronic Fuel Injection system is free from any trouble after the engine start (while engine is running), malfunction indicator lamp turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes malfunction indicator lamp turn ON while the engine is running to warn the driver of such occurrence of trouble

NOTE:

Trouble codes are not stored in back-up memory of ECM. (In other words, even if ECM has detected a troubles, once ignition switch is turned OFF, code Nos. will not be indicated even when diagnosis switch terminal is grounded and ignition switch is turned ON.).

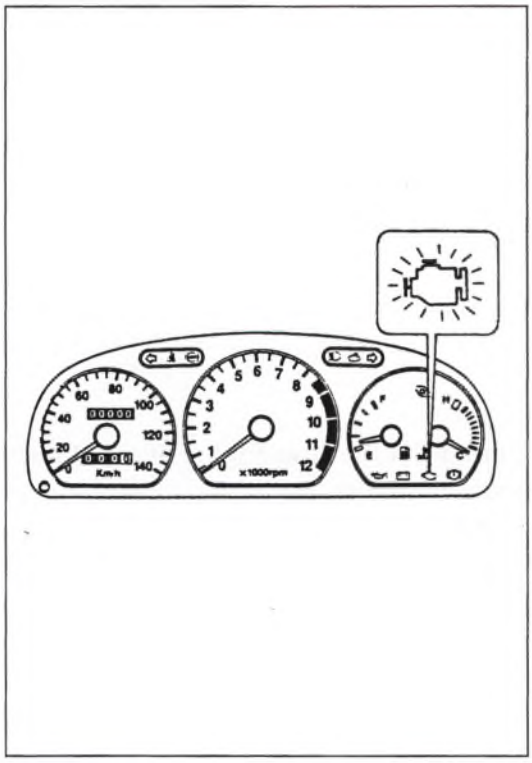
Fail-safe Function

Even when a trouble has occurred in such area of Electronic Fuel Injection system that includes the following parts and a failure signal is sent to ECM, control over the injector, idle air control valve and others is maintained on the basis of the standard signals and/or back-up program prestored in the ECM while ignoring that failure signal and/or CPU. This function is called ''fail-safe function''. Thus, with this function, a certain level of engine performance is available even when some failure occurs in such area and disability in running is avoided.

- Engine coolant temp. sensor
- Throttle position switch
- Vehicle speed sensor
- Intake air temp. sensor
- Manifold absolute pressure sensor
- CPU in ECM

DIAGNOSIS

ECM has on-board diagnostic system (a system self-diagnosis function) as described previously (p. 6E-29). Investigate where the trouble is by referring to "Diagnostic Flow Chart" and "Diagnostic Trouble Code" in this section.



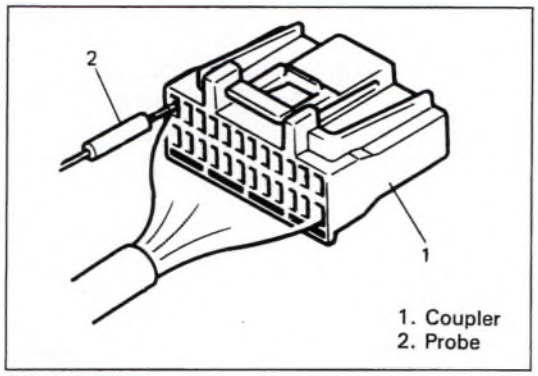
PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC TROUBLE CODE]

- Before identifying diagnostic trouble code indicated by malfunction indicator lamp, don't turn OFF ignition switch, don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse.
 Such disconnection will erase memorized trouble in ECM memory.
- If abnormality of malfunction lies in two or more areas, malfunction indicator lamp indicates applicable codes three times each.
 And flashing of these codes is repeated as long as diagnosis switch terminal is grounded and ignition switch is held at ON position.
- Take a note of diagnostic trouble code indicated first.

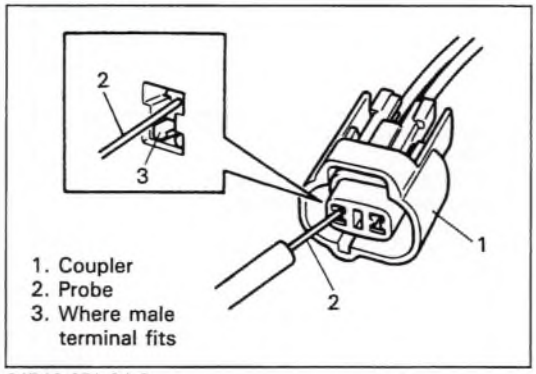
[NOTES ON SYSTEM CIRCUIT INSPECTION]

- Intermittent troubles
 Most intermittent problems are caused by faulty electrical connections or wiring.
 Perform careful check of suspect circuits for:
 — Poor mating of coupler halves, or terminals not fully seated in coupler body (backed out).
 — Improperly formed or damaged terminals. All coupler terminals in problem circuit should be carefully reformed to increase contact tension.
 — Poor terminal to wire connection.
- Never connect any tester (voltmeter, ohmmeter, or whatever) to ECM when its coupler is disconnected. Attempt to do it may cause damage to ECM.
- Never connect an ohmmeter to ECM with its coupler connected to it. Attempt to do it may cause damage to ECM and sensors.
- Be sure to use a voltmeter with high impedance (MΩ/V minimum) or a digital type voltmeter. Any other voltmeter should not be used because accurate measurements are not obtained.
- When disconnecting and connecting coupler, make sure to turn ignition switch OFF.
- When checking connection of terminals, check its male half for bend and female half for excessive opening and both for locking (looseness), corrosion, dust, etc.



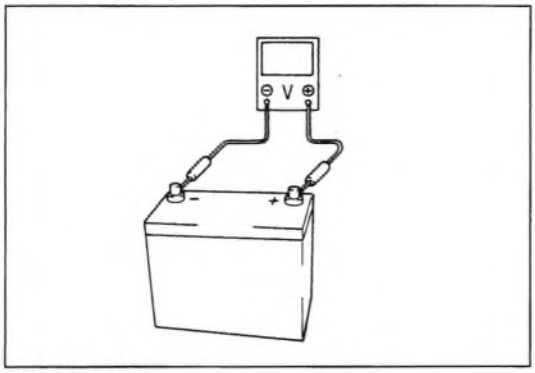
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- When connecting a probe of ohmmeter, voltmeter, etc. to coupler terminal, be sure to connect it from wire harness side of coupler.



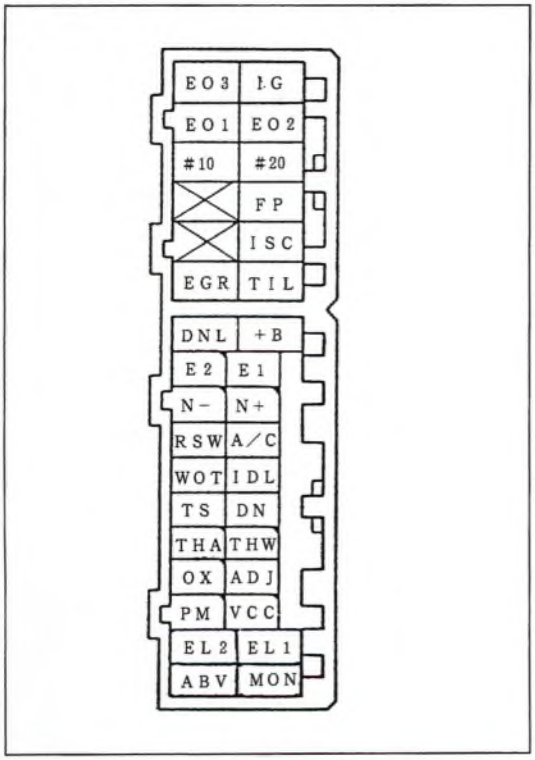
64B40-6E1-34-2

- When connecting meter probe from terminal side of coupler because it can't be connected from harness side, use extra care not to bend male terminal of coupler of force its female terminal open for connection.
 In case of such coupler as shown, connect probe as shown to avoid opening female terminal.
 Never connect probe where male terminal is supposed to fit.



64B40-6E1-34-3

- Before measuring voltage at each terminal, check to make sure that battery voltage is 11V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.



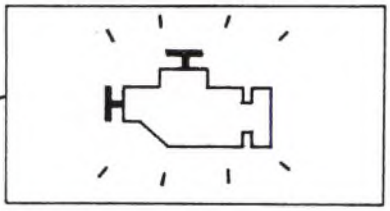
- Note that shorted actuator coil or circuit may cause damage to even a good ECM. Therefore, when replacing ECM, turn OFF ignition switch, measure resistance between each pair of terminals of disconnected ECM coupler (resistance of each circuit) to check for specified value as listed below and then connect new ECM.

Circuit	Terminals	Resistance (Ω)
Fuel injector	#10 — +B	6.9
	#20 — +B	13.8
IAC valve	ISC — +B	22—26
EGR SV valve	EGR — +B	37—44
AB SV valve	ABV — +B	37—44

DIAGNOSTIC FLOW CHART

START

Does malfunction indicator lamp turn ON when ignition switch is turned ON (without starting engine.)?



NO → Does engine start?

NO → Proceed to chart A-1. (ECM power and ground circuit check.)

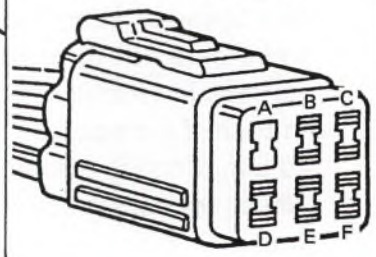
YES → Proceed to chart A-2. (Malfunction indicator lamp circuit check.)

YES

Make test drive to recur trouble. Ground diagnosis switch terminal with ignition switch ON and observe malfunction indicator lamp.

NOTE:
If engine fails to start, crank it for 2 seconds and then while keeping ignitions switch ON (Don't turn it OFF), ground diagnosis switch terminal.

Connect terminal.



A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

Remains ON → Proceed to chart A-3. (Malfunction indicator lamp circuit check.)

Flashes

Is diagnostic trouble code No.12 indicated?

YES → Is diagnostic trouble code No.21 indicated when accelerator pedal is depressed?

NO → Check and repair according to flow chart corresponding to that code No.

YES → Are engine basis parts described in SECTION 6 "ENGINE DIAGNOSIS" in good condition?

YES → Proceed to "TROUBLE DIAGNOSIS" (p. 6E-49.)
Check Electronic Fuel Injection system parts that are not indicated by on-board diag. system (self-diagnosis function.)

NO → Repair or replace.

NO → Proceed to diagnostic trouble code No.21 "TP switch circuit".

1. Warm up engine to normal operating temperature and make test drive.
2. Ground diagnosis switch terminal with ignition switch ON.
3. Is diagnostic troube code No.12 indicated then?

NO

YES

Disconnect service wire from monitor coupler.

Is trouble corrected?

NO

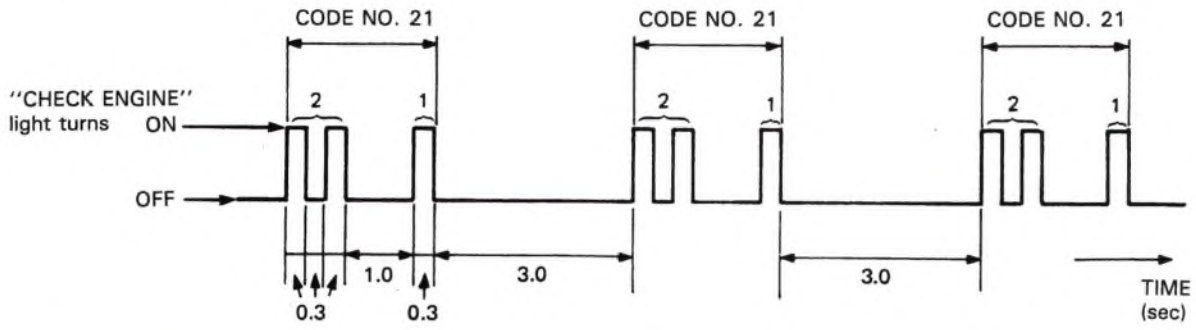
YES

END

64B40-6E-35-1

DIAGNOSTIC TROUBLE CODE TABLE

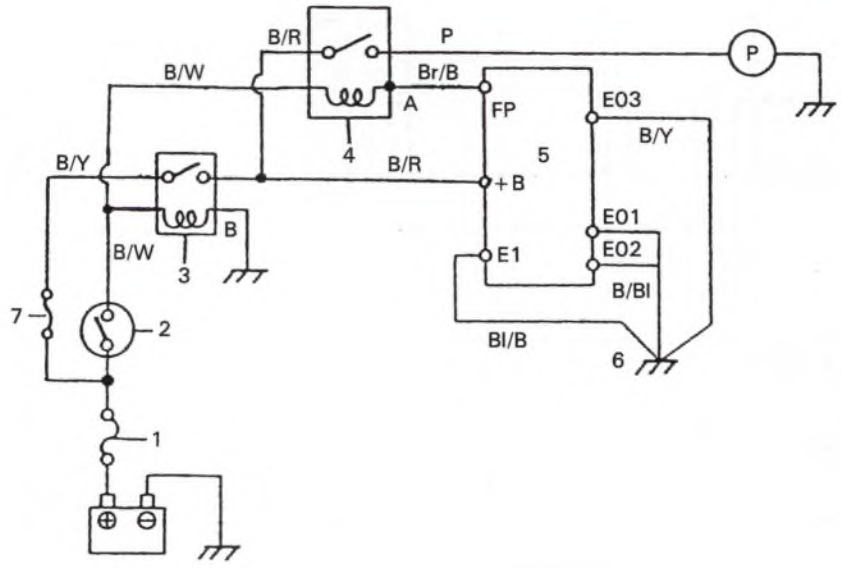
EXAMPLE: THROTTLE POSITION SENSOR FAILURE (CODE NO.21)



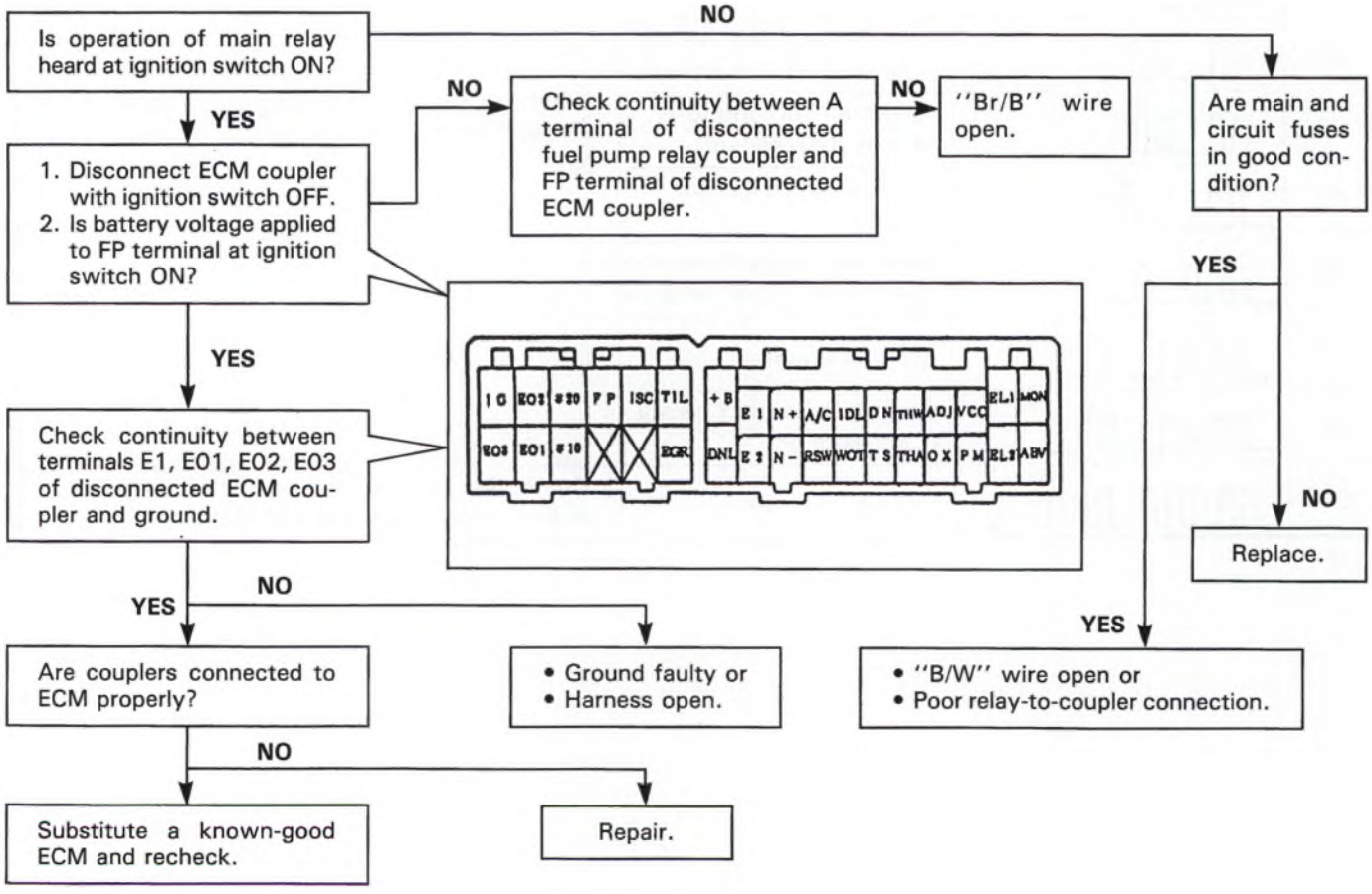
DIAGNOSTIC TROUBLE CODE NO.	DIAGNOSTIC TROUBLE CODE MODE	DIAGNOSTIC AREA	DIAGNOSIS
12	1 2	Normal (A/C OFF)	This code appears when none of the other codes is identified and A/C OFF.
13	1 3	Oxygen sensor	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
14	1 4	Engine coolant temperature sensor (ECT sensor)	
21	2 1	Throttle position switch (Idle switch)	
22	2 2	Throttle position switch (Idle and WOT switch)	
23	2 3	Intake air temperature sensor (IAT sensor)	
24	2 4	Vehicle speed sensor (VSS)	
31	3 1	Manifold absolute pressure sensor (MAP sensor)	
41	4 1	Ignition signal	
42	4 2	Camshaft position sensor (CMP sensor)	
56	5 6	Normal (A/C ON)	This code appears when none of the other codes is identified and A/C ON.

A-1 ECM POWER AND GROUND CIRCUIT CHECK

(MALFUNCTION INDICATOR LAMP DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)



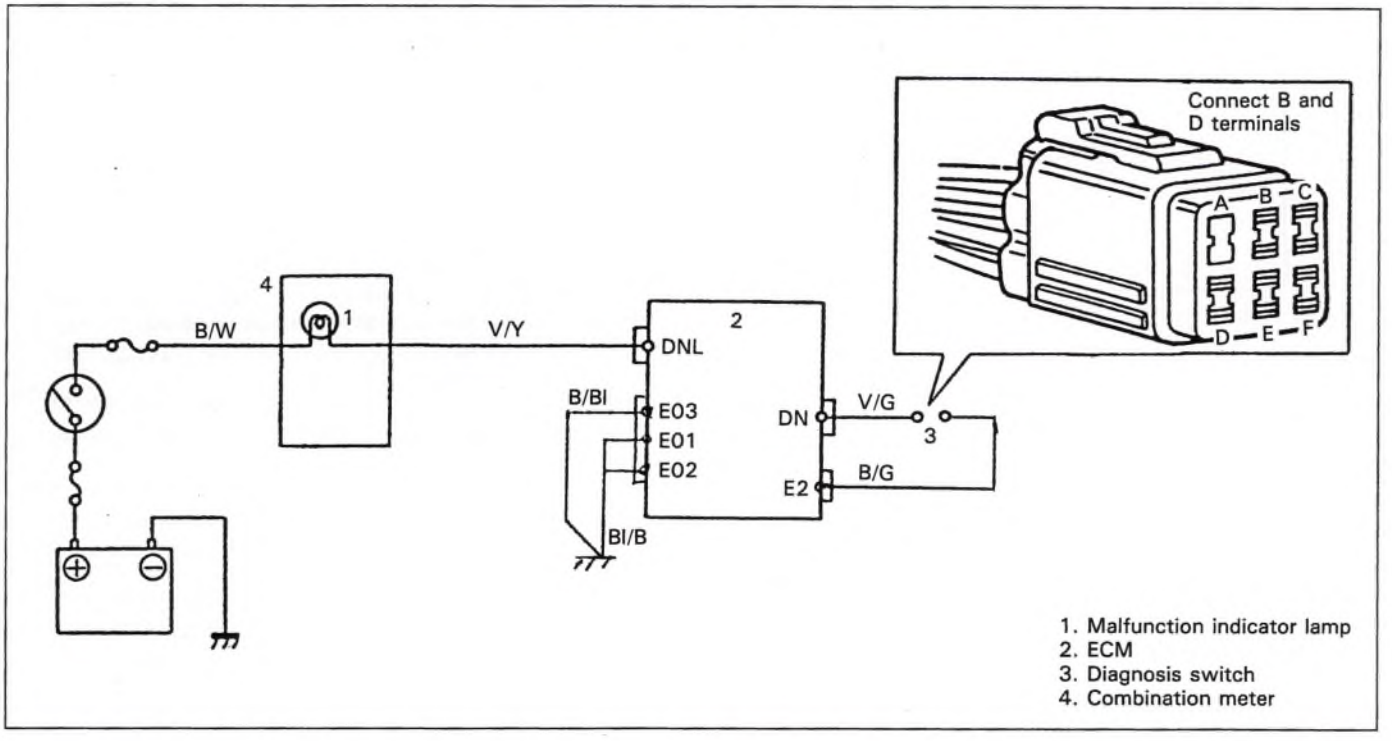
1. Main fuse
2. Ignition switch
3. ECM main relay
4. Fuel pump relay
5. ECM
6. Ground
7. Circuit fuse

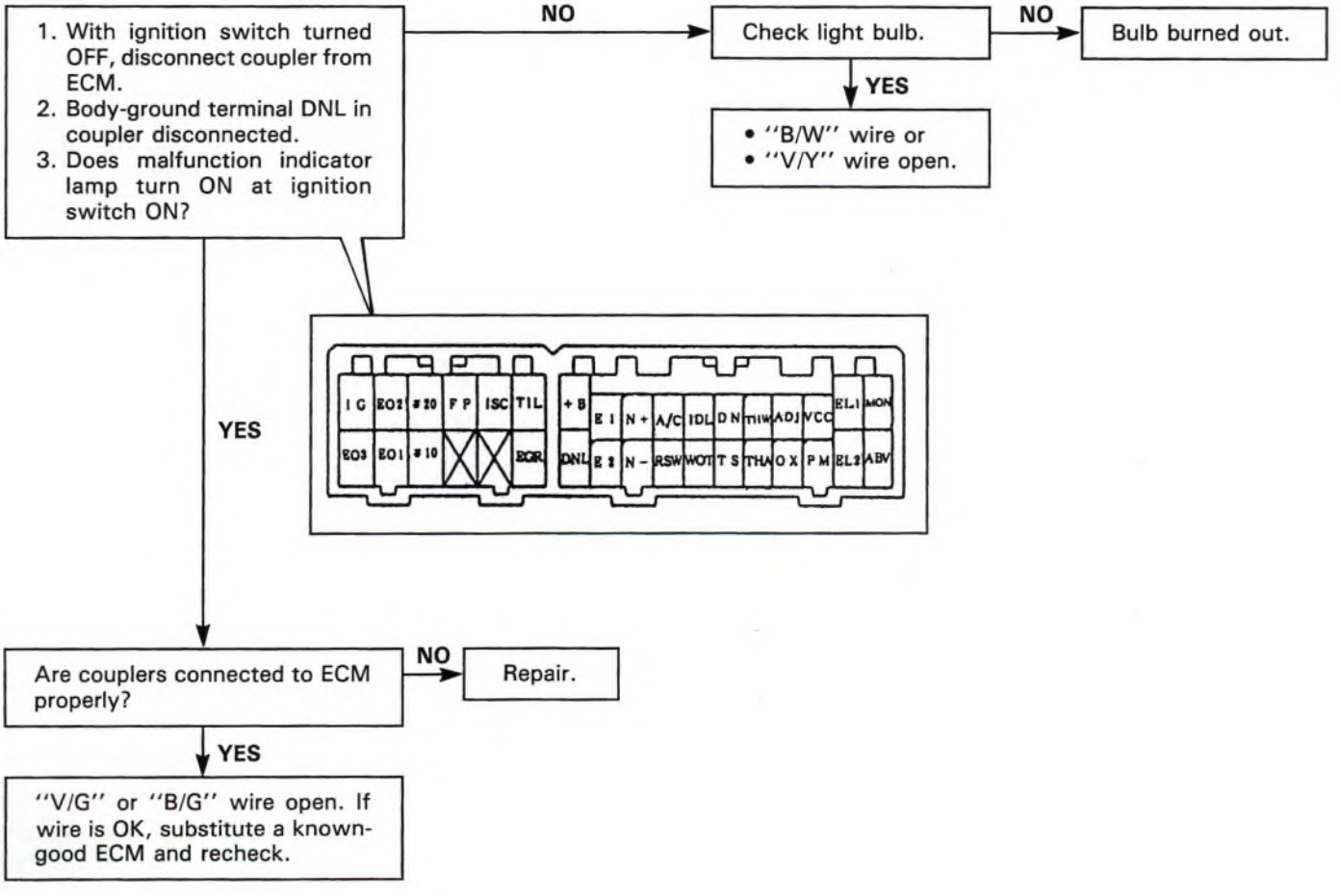


A-2 MALFUNCTION INDICATOR LAMP CIRCUIT CHECK

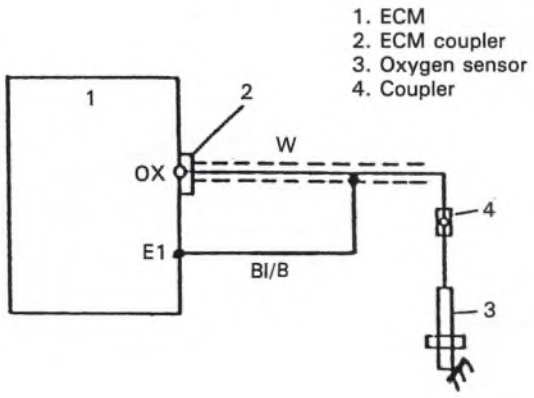
(LIGHT DOES NOT LIGHT BUT ENGINE STARTS.) OR (LIGHT DOESN'T FLASH OR JUST REMAINS ON EVEN WITH DIAGNOSIS SWITCH TERMINAL GROUNDED.)

- Check continuity between DN terminal and E2 terminal of ECM, and E01, E02 E03 terminals and ground.





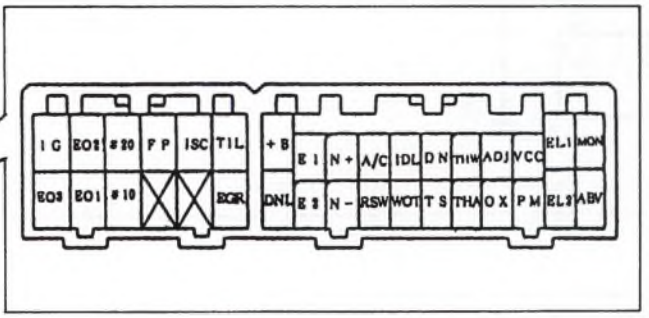
CODE NO.13 OXYGEN SENSOR CIRCUIT (SIGNAL VOLTAGE IS LOW OR DOESN'T CHANGE)



NOTE:

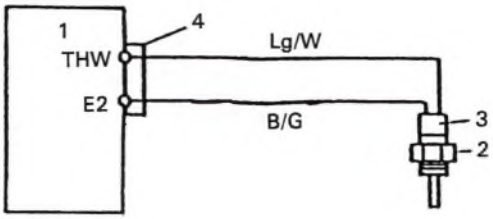
- **Before diagnosing trouble according to flow chart given below, check to make sure that following system and parts other than Electronic Fuel Injection system are in good condition.**
 - **— Air cleaner (clogged)**
 - **— Vacuum leaks (air inhaling)**
 - **— Spark plugs (contamination, gap)**
 - **— High-tension cords (crack, deterioration)**
 - **— Distributor rotor or cap (wear, crack)**
 - **— Ignition timing**
 - **— Engine compression**
 - **— Any other system and parts which might affect A/F mixture or combustion.**
- **If code No.13 and another code No. are indicated together, the latter has priority. Therefore, check and correct what is represented by that code No. first and then proceed to the following check.**
- **Be sure to use a voltmeter with high impedance (MΩ/V minimum) or digital type voltmeter for accurate measurement.**

1. Remove ECM and connect couplers to ECM.
2. Warm up engine to normal operating temperature.
3. Connect voltmeter between "OX" terminal of ECM coupler and body ground.
4. Maintain engine speed at 2000 r/min. After 60 seconds, check voltmeter.



0V	Remains unchanged at below 0.45V.	Remains unchanged at above 0.45V.	Deflects between above and below 0.45V repeatedly.
• Wire between sensor and ECM open or • Poor connection. If wire and connection are OK, replace oxygen sensor and recheck.	Maintain engine speed at 2000 r/min. After 60 sec., disconnect vacuum hose from MAP sensor and check voltmeter. Is voltage 0.45V or more?	Poor OX connection or rich A/F mixture. • Check TP switch, clogged MAP sensor hose, MAP sensor, IAT sensor, ECT sensor, fuel pressure and injector. If all above are OK, check ECM and its circuit referring to p. 6E-57.	Oxygen sensor and its circuit (Air/fuel ratio feed back system) are in good condition. Intermittent trouble or faulty ECM. Recheck referring to "intermittent trouble" on p. 6E-30.
	NO	**YES**	
Faulty oxygen sensor.		Poor OX connection or lean A/F mixture. • Check MAP sensor, ECT sensor, IAT sensor, fuel pessure and injector. If all above are OK, check ECM and its circuit referring to p. 6E-57.	

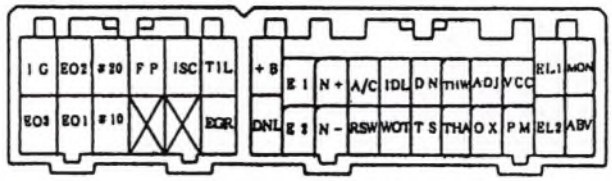
CODE NO.14 ECT SENSOR (ENGINE COOLANT TEMP. SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH OR HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



1. ECM
2. ECT sensor
3. ECT sensor coupler
4. ECM coupler

NOTE:
When Code Nos. 14, 23 and 31 are indicated together, it is possible that "B/G" wire is open or E2 terminal connection is poor.

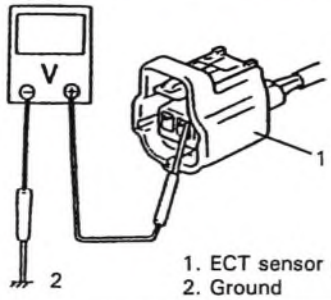
With ignition switch ON, check voltage at "Lg/W" wire terminal of ECM coupler.



- Below 0.15V. → To ①.
- 0.15—4.85V. → To ② on next page.
- Above 4.85V. → To ③ on next page.

① BELOW 0.15V

1. Disconnect ECT sensor coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Lg/W" wire terminal of ECT sensor coupler 4V or more?.



1. ECT sensor coupler
2. Ground

YES

Check ECT sensor referring to p. 6E-68.
Is it in good condition?

YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

NO

Faulty ECT sensor.

NO

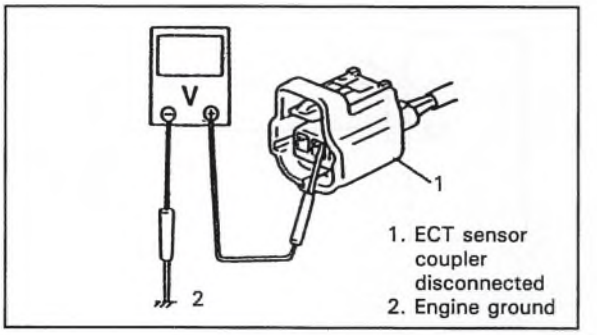
"Lg/W" wire shorted to "B/G" wire or ground circuit.
If wire is OK, substitute a known-good ECM and recheck.

② 0.15V—4.85V

Intermittent troubule or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

③ ABOVE 4.85V

1. Disconnect ECT sensor coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Lg/W" wire terminal of ECT sensor coupler. Is it about 4—5V?



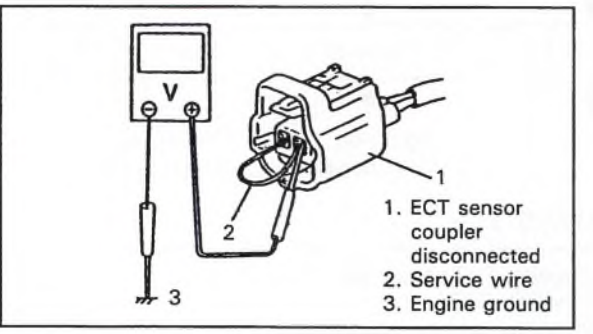
1. ECT sensor coupler disconnected
2. Engine ground

YES

1. Using service wire, connect ECT sensor coupler terminals.
2. Check voltage at "Lg/W" wire terminal of ECT sensor coupler with ignition switch ON. Is it below 0.15V?

NO

"Lg/W" wire open, poor THW connection or "Lg/W" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.



1. ECT sensor coupler disconnected
2. Service wire
3. Engine ground

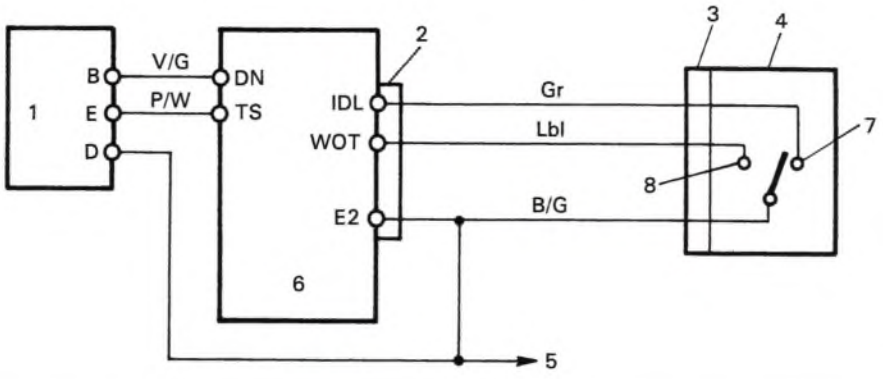
NO

"B/G" wire open or poor E2 connection.
If wire and connection are OK, faulty ECM.
Substitute a known-good ECM and recheck.

YES

Poor ECT sensor-to-coupler connection or faulty ECT sensor.
If connection and ECT sensor are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-30.

CODE NO.21 TP SWITCH (THROTTLE POSITION SWITCH) CIRCUIT (IDLE SWITCH OFF, SIGNAL INPUTTED WITH DIAGNOSIS TERMINAL GROUNDED)



1. Monitor coupler
2. ECM coupler
3. TP switch coupler
4. TP switch
5. To other sensors
6. ECM
7. Idle switch
8. WOT switch

IDL : Idle switch terminal
WOT: Wide open throttle switch
E2 : Sensor ground terminal
DN : Diagnosis switch terminal
TS : Test switch terminal

NOTE:
This code is used to check installation position of the TP switch and function of the idle switch and its circuit.
The idle switch is normal if
- **Code No.12 appears when the throttle valve is closed completely, and**
- **Code No.21 some time after the accelerator pedal is depressed slightly, with B and D terminals of the monitor coupler shorted.**

If anything abnormal is found, proceed to following chart.

With ignition switch ON and B and D terminals of monitor coupler connected, is voltage applied to DN terminal of ECM coupler 0.5V or less?

YES ↓

Check idle switch in TP switch referring to p. 6E-67.
If it in good condition?

YES ↓

1. Disconnect TP switch coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr" wire terminal of TP switch coupler about 5V?

YES ↓

With ignition switch ON and "Gr" and "B/G" wire terminals of TP switch coupler connected, is voltage applied to "Gr" wire terminal of TP switch coupler 0.5V or less?

YES ↓

- Poor "Gr" or "B/G" wire terminal connection or
- Idle switch (in TP switch) faulty.

If wires and connection are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-30.

NO →

"V/G" or "B/G" wire (between ECM and monitor coupler) open or short to ECM power circuit.

NO →

Faulty idle switch or TP sensor installation angle maladjusted.

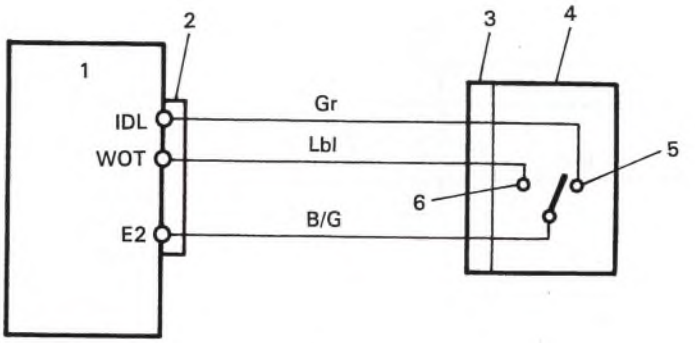
NO →

"Gr" wire open or short, or poor IDL terminal connection.
If wires and connections are OK, substitute a known-good ECM and recheck.

NO →

- "B/G" wire open or short or
- poor E2 connection.

CODE NO.22 TP SWITCH (THROTTLE POSITION SWITCH) CIRCUIT (BOTH IDLE SWITCH AND WIDE OPEN THROTTLE SWITCH TURNED ON AT THE SAME TIME)



1. ECM
2. ECM coupler
3. TP switch coupler
4. TP switch
5. Idle switch
6. WOT switch

IDL : Idle switch terminal
WOT: Wide open throttle switch terminal
E2 : Sensor ground terminal

1. Disconnect TP switch coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr" wire terminal of TP switch coupler about 5V?

YES ▼

With ignition switch ON, is voltage applied to "Lbl" wire terminal of TP switch coupler about 5V?

YES ▼

Check TP switch referring to p. 6E-67.
Is it in good condition.

YES ▼

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

NO ▼

"Gr" wire shorted to ground circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.

NO ▼

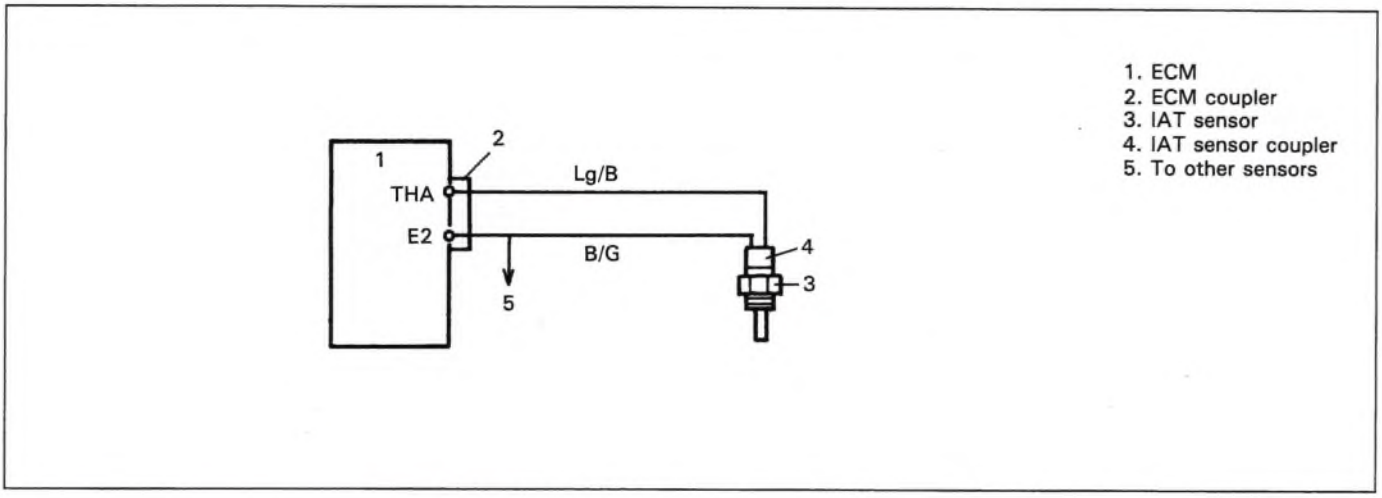
- "Lbl" wire shorted to ground circuit.
 If wire and connection are OK, subsutitute a known-good ECM and recheck.

NO ▼

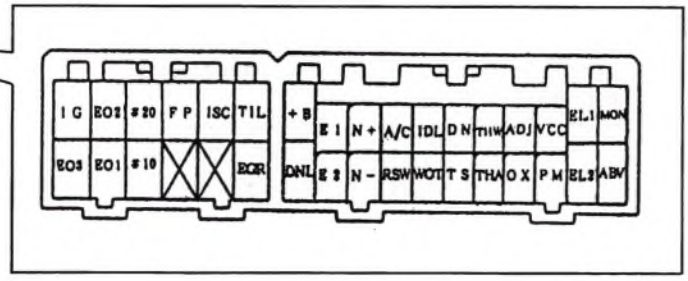
Faulty TP switch.

NOTE:
If trouble is caused by throttle wide open signal not being fed to ECM, it cannot be checked by self-diagnosis function. Function of wide open throttle switch should be checked by measuring voltage at "WOT" terminal of ECM.

CODE NO.23 IAT SENSOR (INTAKE AIR TEMP. SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH OR HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



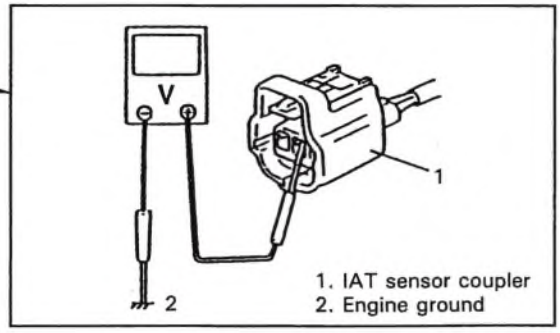
With ignition switch ON, check voltage at THA terminal of ECM coupler.



- Below 0.15V. → To ①.
- 0.15—4.85V. → To ② on next page.
- Above 4.85V. → To ③ on next page.

① Below 0.15V

1. Disconnect IAT sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg/B" wire terminal of IAT sensor coupler 4V or more?.



YES

Check IAT sensor referring to p. 6E-68.
Is it in good condition?

YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

NO

Faulty IAT sensor.

NO

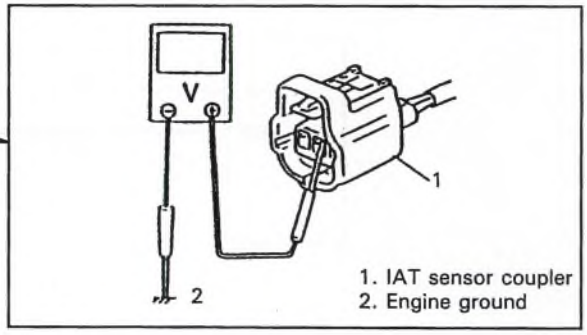
"Lg/B" wire shorted to "B/G" wire or ground circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.

② 0.15V—4.85V

Intermittent troubule or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

③ Above 4.85V

1. Disconnect IAT sensor coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Lg/B" wire terminal of IAT sensor coupler. Is it about 4—5V?



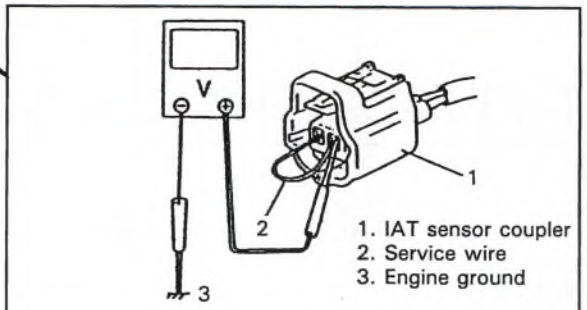
1. IAT sensor coupler
2. Engine ground

YES

1. Using service wire, connect IAT sensor coupler terminals.
2. Check voltage at "Lg/B" wire terminal of IAT sensor coupler with ignition switch ON. Is it below 0.15V?

NO

"Lg/B" wire open, poor THA connection or "Lg/B" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.



1. IAT sensor coupler
2. Service wire
3. Engine ground

NO

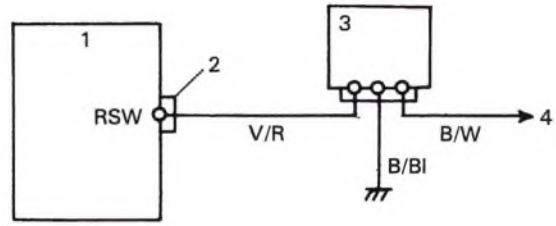
"B/G" wire open or poor E2 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

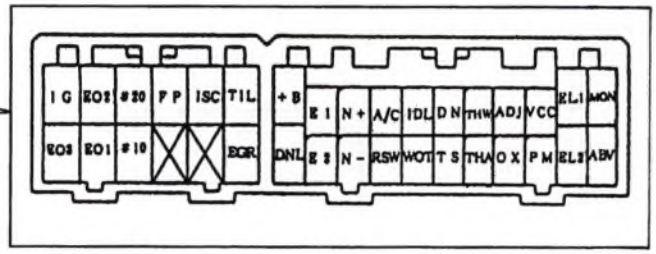
Faulty IAT sensor or poor IAT sensor-to-coupler connection.
If IAT sensor and connection are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E-30.

CODE NO.24 VSS (VEHICLE SPEED SENSOR) CIRCUIT (VSS SIGNAL NOT INPUTTED ALTHOUGH FUEL IS KEPT CUT AT LOWER THAN 4000 r/min. FOR LONGER THAN SOME SECONDS)

1. ECM
2. ECM coupler
3. Vehicle speed sensor
4. To ignition switch



1. Disconnect ECM coupler with ignition switch OFF.
2. Connect ohmmeter between RSW terminal of ECM coupler and body ground.
3. Hoist rear end of vehicle and lock rear right tire.
4. Turn rear left tire slowly. Does ohmmeter indicator deflect between 0 and ∞ a few times while tire is turned one revolution?



NO

Check VSS referring to p. 6E-69.
Is it in good condition?

YES

Poor RSW connection. If connection is OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

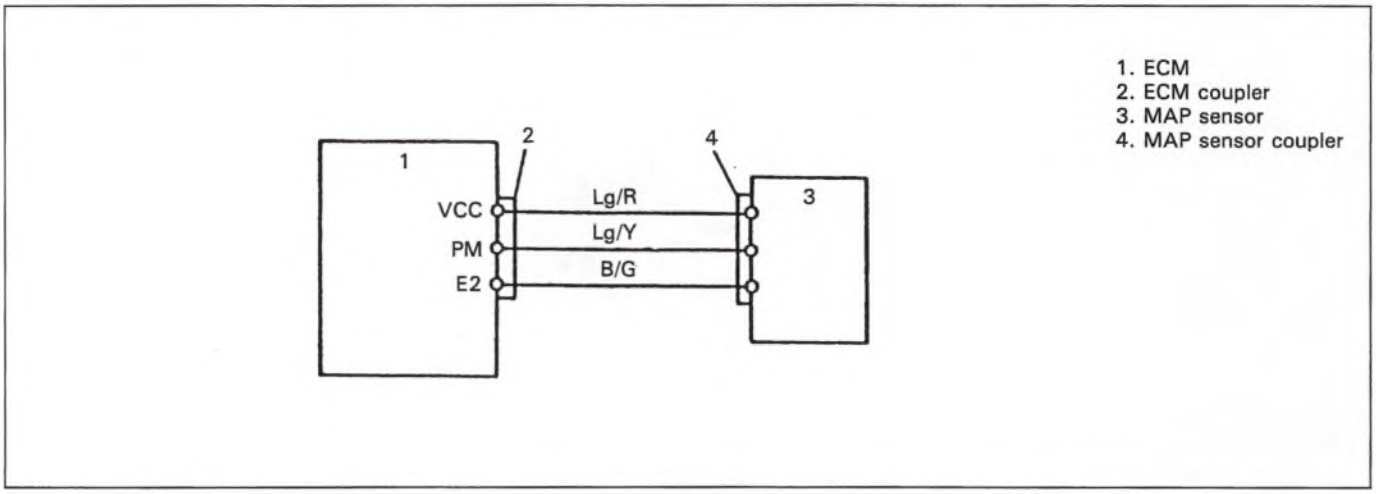
YES

"V/R" wire open, "B/W" wire open, "B/Bl" wire open, poor coupler connection or poor "B/Bl" wire ground.

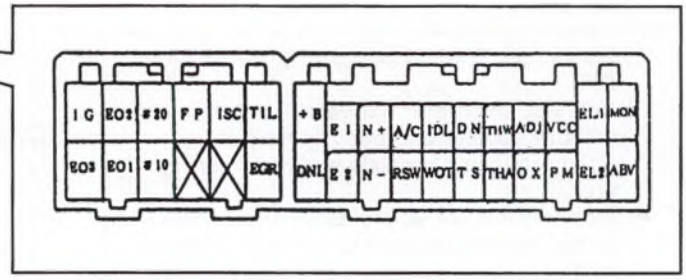
NO

Faulty VSS.

CODE NO.31 MAP SENSOR (MANIFOLD ABSOLUTE PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW—LOW PRESSURE—HIGH VACUUM OR SIGNAL VOLTAGE—HIGH PRESSURE—LOW VACUUM)



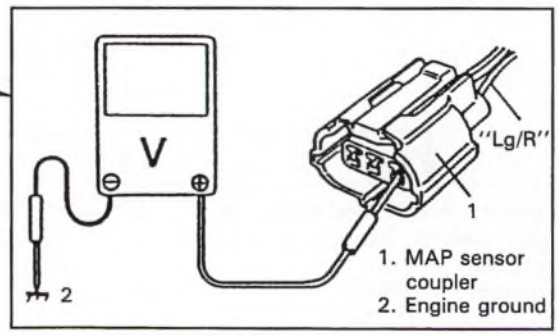
With ignition switch ON, check voltage at PM terminal of ECM coupler.



- Below 0.25V. → To ①.
- 0.15—4.85V. → To ② on next page.
- Above 4.85V. → To ③ on next page.

① Below 0.25V

1. Disconnect MAP sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg/R" wire terminal of MAP sensor coupler 4—5V?.



YES

Check MAP sensor referring to p. 6E-66. Is it in good condition?

YES

"Lg/Y" wire shorted to ground circuit or poor MAP sensor-to-coupler connection.
If wire and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

NO

Faulty MAP sensor.

NO

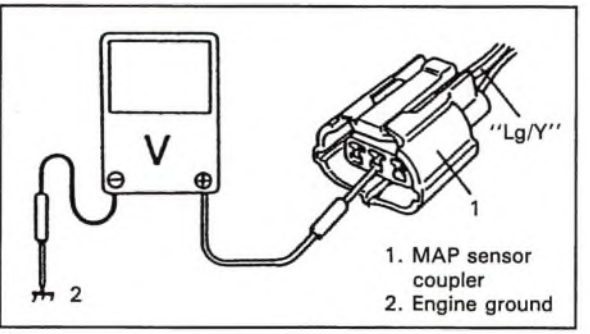
"Lg/R" wire open, "Lg/R" wire shorted to ground circuit or poor VCC connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

② 0.25V—4.85V

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

③ Above 4.85V

1. Disconnect MAP sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg/Y" wire terminal of MAP sensor coupler 4—5V?.



YES

Check MAP sensor referring to p. 6E-65.
Is it in good condition?

YES

"Lg/R" wire shorted to "Lg/Y" wire, "B/G" wire open, poor E2 connection or poor MAP sensor-to-"B/G" wire connection.
If wires and connection are OK, intermittent trouble of faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

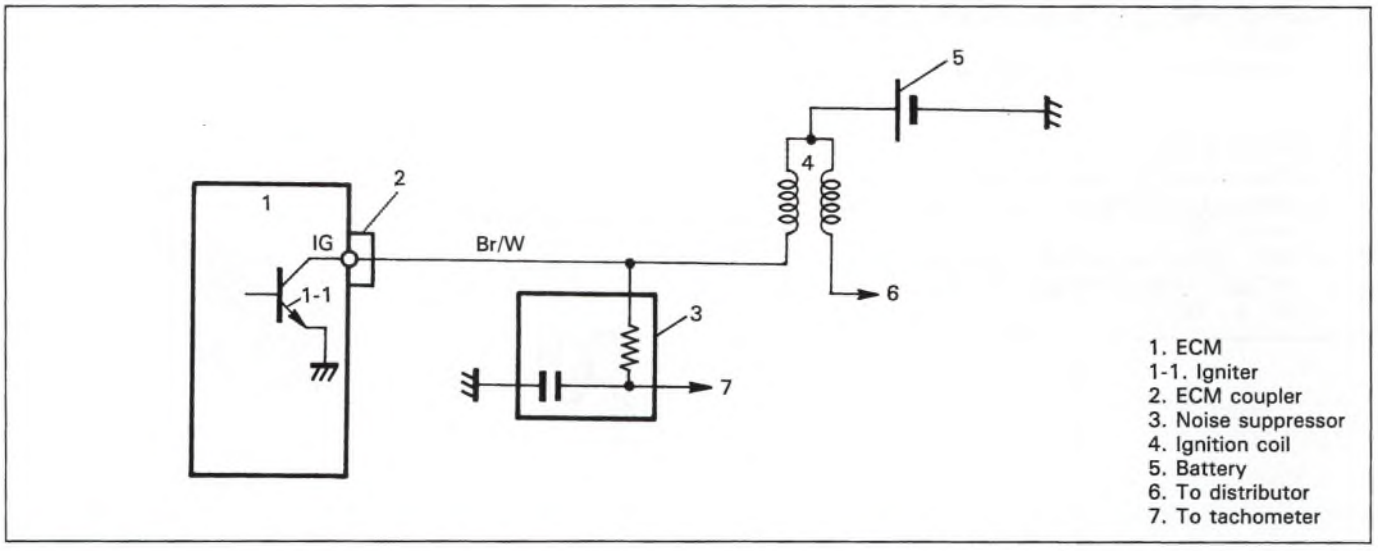
NO

Faulty MAP sensor.

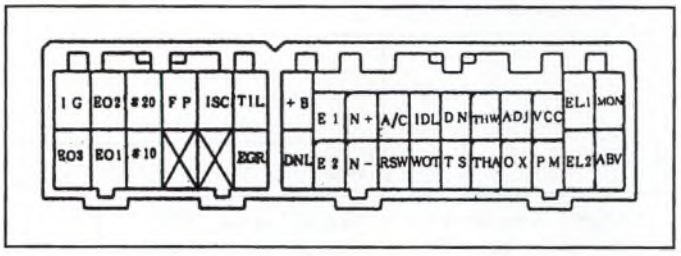
NO

"Lg/Y" wire open, poor PM connection or "Lg/Y" wire shorted to power circuit.
If wires and connection are OK, substitute a known-good ECM and recheck.

CODE NO.41 IGNITION SIGNAL CIRCUIT (IGNITION SIGNAL NOT INPUTTED FOR SOME SECONDS AT ENGINE CRANKING)



1. With ignition switch OFF, disconnect ignition coil coupler.
2. Is battery voltage generated at IG terminal of coupler when ignition switch is turned ON?



YES

1. With ignition switch OFF, disconnect ignition coil coupler.
2. Is battery voltage generated at IG terminal of ECM when ignition switch is turned ON?

NO

- Battery-to-ignition coil wiring open or shorted, or poor connection at terminal.

YES

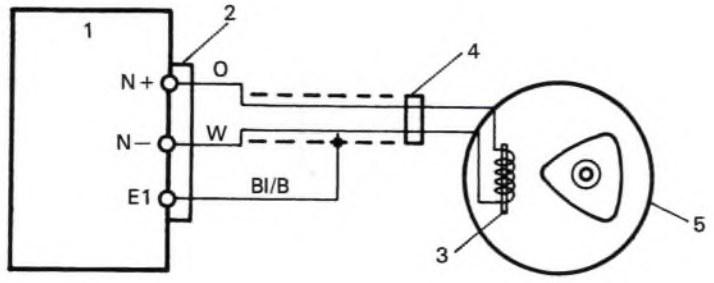
- Poor connection at IG terminal.
- Faulty noise suppressor.

If connection at IG terminal and noise suppressor are OK, substitute a known-good ECM and recheck.

NO

- "Br/W" wire open or shorted.
- Poor connection at ignition coil terminal.
- Faulty ignition coil.

CODE NO.42 CMP SENSOR (CAMSHAFT POSITION SENSOR) SIGNAL CIRCUIT (CMP SENSOR SIGNAL NOT INPUTTED 2 SECONDS AT ENGINE CRANKING)



1. ECM
2. ECM coupler
3. CMP sensor
4. CMP sensor coupler
5. Distributor

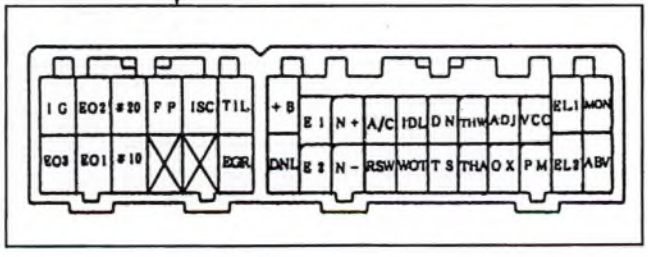
Check signal rotor air gap referring to SECTION 6F.
Is it in good condition?

YES

1. Disconnect ECM coupler with ignition switch OFF.
2. Is resistance between N+ and N− of ECM coupler, 210−260 Ω?

YES

Poor N+ connection, poor N− connection or sensor wire shorted to ground.
If wires and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.



NO

Maladjusted air gap.

NO

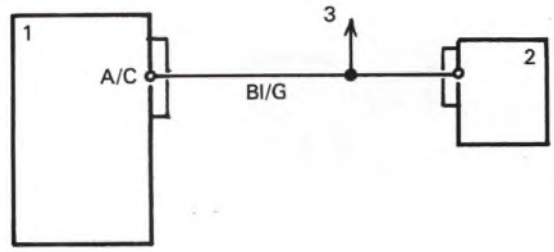
Check CMP sensor referring to SECTION 6F.
Is it in good condition?

NO → Faulty CMP sensor.

YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

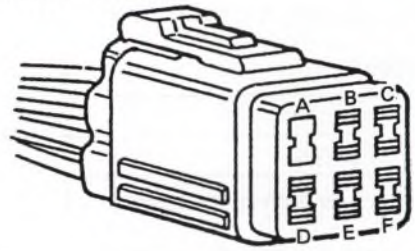
CODE NO.56 A/C NORMAL OPERATING SIGNAL CIRCUIT (A/C SIGNAL INPUTTED AT OTHER DIAGNOSTIC TROBULE CODE NOT INPUTTED)



1. ECM
2. A/C controller
3. To idle-up VSV

Is diagnostic trouble code No.12 at diagnosis switch terminal grounded and A/C OFF.

Connect B—D terminal

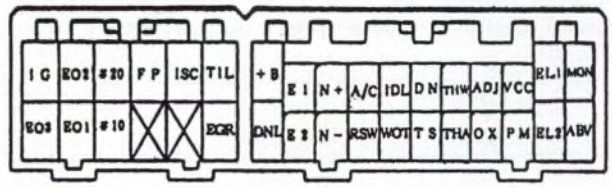


NO

Check and repair according to flow chart corresponding to that code No.

YES

1. Connect voltmeter between A/C terminal of ECM and body ground.
2. Is voltage 0V at A/C ON and engine idle-up condition.



YES

Poor A/C terminal of ECM, poor "Bl/G" wire terminal of A/C controller coupler connection.
If wires and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-30.

NO

Open "Bl/G" wire, poor A/C controller-to-coupler connection, poor ECM-to-coupler connection, A/C controller faulty.

TROUBLE DIAGNOSIS

This section describes trouble diagnosis of Electronic Fuel Injection system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnosis function).

When diagnostic trouble code No.12 is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those engine basic parts as described in "ENGINE DIAGNOSIS" are all in good condition, check following Electronic Fuel Injection system parts which may be a possible cause for each symptom of the engine.

SYMPTOM	POSSBILE CAUSE	INSPECTION
Hard or no starting (Engine cranks OK)	• Shortage of fuel in fuel tank	
	• Injector or its circuit faulty	Diagnostic flow chart B-1.
	• Faulty fuel pump or its circuit open	Diagnostic flow chart B-2.
	• Fuel pressure out of specification	Diagnostic flow chart B-4.
	• Faulty fast idle air valve	Check fast idle air valve.
	• Engine start signal not to fed	Diagnostic flow chart B-5.
	• Poor performance of IAT sensor, ECT sensor or MAP sensor	See p. 6E-68 or 6E-66.
	• Faulty ECM	See p. 6E-57.
NOTE: • **If engine doesn't start at all, perform fuel injector and its circuit check first. (Advance to "Diagnostic Flow Chart B-1".)** • **If engine is hard to start only when it is cold, check fast idle air valve first.**		
Engine fails to idle	• Shortage of fuel in fuel tank	
	• Faulty idle air control system	Diagnostic flow chart B-3.
	• Maladjusted idle speed adjusting screw	See p. 6E-59.
	• Faulty fast idle air valve	Check fast idle air valve.
	• Faulty EGR system	See p. 6E-71.
	• Fuel pressure out of specification	Diagnostic flow chart B-4.
	• Faulty injector	Check injector for resistance and injection condition. (Refer to p. 6E-63).
	• Poor performance of IAT sensor, ECT sensor or MAP sensor	See p. 6E-68 or 6E-66.
	• Faulty ECM	See p. 6E-57.
NOTE: **If engine fails to idle only when it is cold, check fast idle air valve.**		

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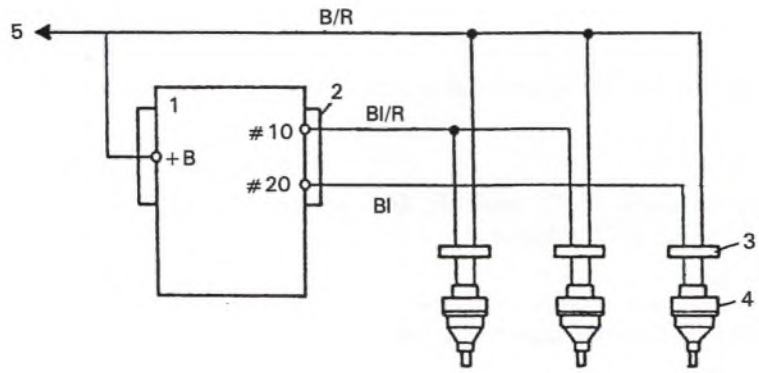
SYMPTOM	POSSIBLE CAUSE	INSPECTION
Improper engine idle speed	• Maladjusted accelerator cable play	See p. 6E-59.
	• Clogged MAP sensor vacuum passage	Check vacuum hose and filter.
	• Faulty idle air control system	Diagnostic flow chart B-3.
	• Faulty A/C SV valve control system (if equipped)	See section 1B.
	• Faulty idle switch (in TP switch)	See p. 6E-67.
	• Maladjusted idle speed adjusting screw	See p. 6E-59.
	• Faulty fast idle air valve	Check fast idle air valve.
	• Fuel pressure out of specification	Diagnostic flow chart B-4.
	• Poor performance of IAT sensor, ECT sensor or MAP sensor	See p. 6E-68 or 6E-66.
	• Faulty ECM	See p. 6E-57.
NOTE: **If engine idle speed lowers below specification only when electric load is applied (e.g. headlight ON), check idle air control system first.**		
Engine has no or poor power	• Maladjusted accelerator cable play	See p. 6E-59.
	• Faulty EGR system	See p. 6E-71.
	• Fuel pressure out of specification (Low fuel pessure)	Diagnostic flow chart B-4.
	• Poor performance of TP switch, IAT sensor, ECT sensor or MAP sensor	See p. 6E-67, 6E-68 or 6E-66.
	• Faulty injector(s)	See p. 6E-63.
	• Faulty ECM	See p. 6E-57.
Engine hesistates when accelerating	• Clogged MAP sensor vacuum passage	Check vacuum hose and filter.
	• Faulty EGR system	See p. 6E-71.
	• Fuel pressure out of specification (Low fuel pressure)	Deagnostic flow chart B-4.
	• Poor performance of TP switch, IAT sensor, ECT sensor or MAP sensor	See p. 6E-67, 6E-68 or 6E-66.
	• Faulty ECM	See p. 6E-57.
Surges (Variation in car speed is felt although accelea-tor pedal is not operated)	• Variable fuel pressure (Clogged fuel filter, faulty fuel pressure regulator, etc.)	Diagnostic flow chart B-4.
	• Poor performance of MAP sensor	See p. 6E-66.
	• Faulty injector(s)	See p. 6E-63.
	• Faulty ECM	See p. 6E-57.

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SYMPTOM	POSSIBLE CAUSE	INSPECTION
Poor gasoline mileage	• High idle speed	Refer to item "Improper engine idle speed" previously outlined.
	• Fuel pressure out of specification or fuel leakage	Diagnostic flow chart B-4.
	• Faulty injector(s)	See p. 6E-63.
	• Poor performance of TP switch, IAT sensor, MAP sensor or ECT sensor	See p. 6E-67, 6E-68 or 6E-66.
	• Faulty ECM	See p. 6E-57.
Excessive hydrocarbon (HC) emission	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F.
	• Vacuum leaks	
	• Low compression	See section 6.
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor.
	• Fuel pressure out of specification	Diagnostic flow chart B-4.
	• A/F feed back compensation fails	
	— Faulty TP switch	See p. 6E-67.
	— Poor performance of ECT sensor or MAP sensor	See p. 6E-68 or 6E-66.
	• Poor performance of IAT sensor	See p. 6E-68.
	• Faulty injector	See p. 6E-63.
	• Faulty ECM	See p. 6E-57.
Excessive carbon monoxide (CO)	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F.
	• Low compression	See section 6.
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor.
	• Fuel pressure out of specification	Diagnostic flow chart B-4.
	• A/F feed back compensation fails	
	— Faulty TP switch	See p. 6E-67.
	— Poor performance of ECT sensor or MAP sensor	See p. 6E-68 or 6E-66.
	• Poor performance IAT sensor	See p. 6E-68.
	• Faulty injector	See p. 6E-63.
	• Faulty ECM	See p. 6E-57.

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B-1 FUEL INJECTOR CIRCUIT CHECK (ENGINE DOES NOT START)



1. ECM
2. ECM coupler
3. Injector coupler
4. Injector
5. From battery

Using sound scope, check each injector for operating sound at engine cranking.

NO

None or some of 3 injectors makes operating sound.

NO

1. Disconnect couplers from ECM with ignition switch OFF.
2. Check resistance or voltage between such terminals as listed below.
 Is specified resistance or voltage obtained?

	TERMINALS	RESISTANCE OR VOLTAGE
①	Between #10 and +B	6.5—7.3 Ω
②	Between #20 and +B	13.1
③	Betwwen +B and body ground	10—14V at ignition switch ON

YES

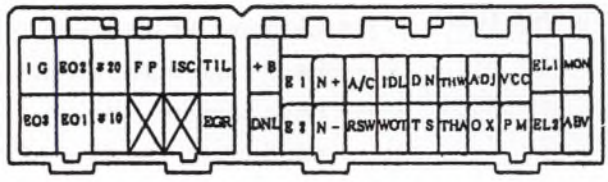
Poor both #10 and #20 connections, poor +B connection, each coupler connection of injector(s) not making operating sound or each injector itself faulty.
If all above are OK, substitute a known-good ECM and recheck.

YES

All 3 injectors make operating sound.

YES

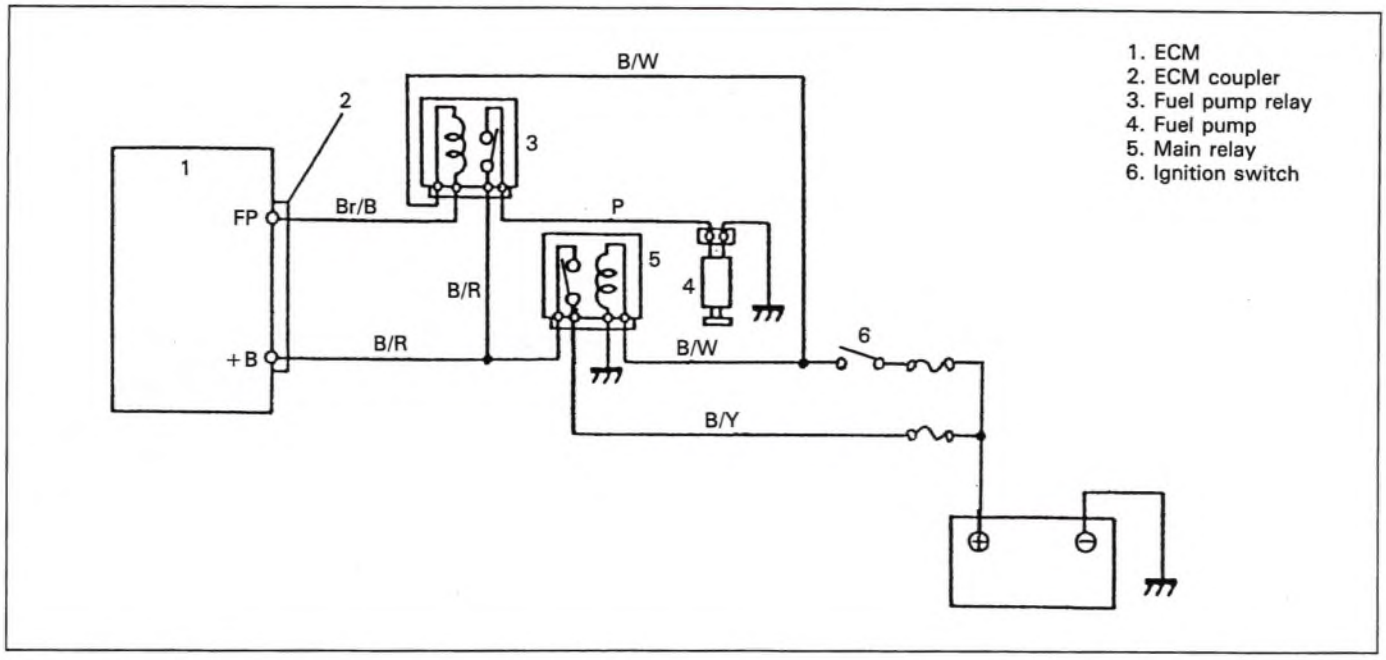
Fuel injector circuit is in good condition.



NO

If not in ① :
"BI/R" wire open, "B/R" wire open, poor injector coupler connection or injector itself faulty.
If not in ② :
"BI" wire open, "B/R" wire open, poor injector coupler connection or injector itself faulty.
If not in ③ :
"B/R" wire open.

B-2 FUEL PUMP AND ITS CIRCUIT CHECK



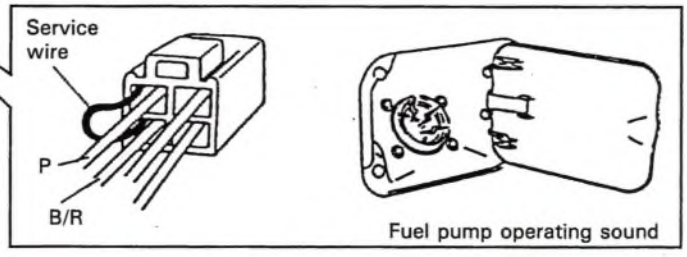
Is fuel pump heard to operate for 5 sec. after ignition switch ON?

NO

1. Remove fuel pump relay from main fuse box with ignition switch OFF.
2. Using service wire, connect "P" and "B/R" wire terminals.
3. Is fuel pump heard to operate at ignition switch ON?

YES

Fuel pump circuit in good condition.



YES

Check fuel pump relay referring to p. 6E-69. Is it in good condition?

NO

"P" wire open, poor fuel pump coupler connection or faulty fuel pump.

YES

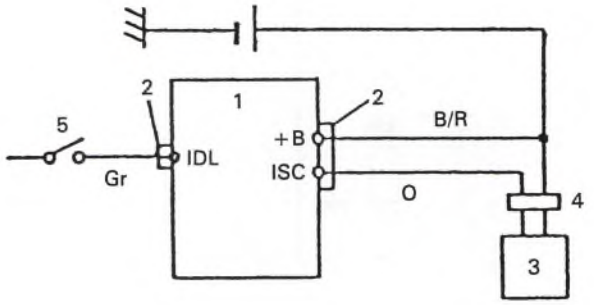
Poor relay coupler connection, "Br/B" wire open or poor FP connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

NOTE:
Before substituting a known-good ECM, check to make sure that resistance of coil in relay is as specified.

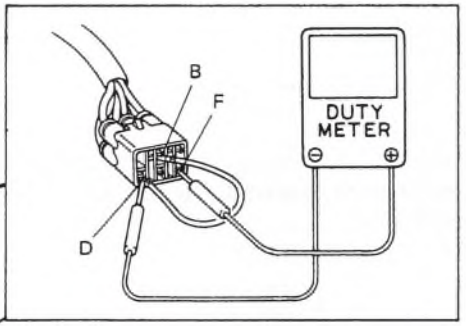
NO

Faulty fuel pump relay.

B-3 IDLE AIR CONTROL (IAC) SYSTEM CHECK



1. ECM
2. ECM coupler
3. IAC valve
4. IAC valve coupler
5. Idle switch



1. Warm up engine to normal operating temperature and keep it idle.
2. Using service wire, ground diagnosis switch terminal.
3. Is diagnostic trouble code No.12 indicated?

YES

Check idle speed and IAC duty referring to p. 6E-59.
Are they within specification?

NO

Go back to "Diagnostic Flow Chart" on p. 6E-32.

NO

High idle speed
To ① on next page.

Low idle speed
To ② on next page.

YES

Idle speed is within specification but duty is not.
1. Adjust IAC duty to specification.

NOTE:
- **When ON duty of IAC is close to 0% (but close to 100% with such duty meter that indicates OFF duty, in other words, when IAC valve is almost fully closed), check that air intake system is free from vacuum leakage and adjust it.**
- **If duty remains unchanged even when adjusting screw is turned, check duty output terminal circuit.**

2. Proceed to next step.

Is engine idle speed kept at specified speed even with headlights turned ON?

NO

Proceed to system circuit check ③ on next page.

YES

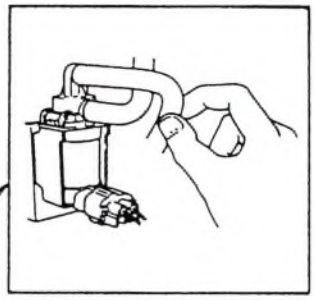
System is in good condition.

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B-3 IDLE AIR CONTROL (IAC) SYSTEM CHECK (Continued)

① HIGH IDLE SPEED

1. Block IAC valve hose by pinching it.
2. Does engine speed reduce then?



YES

Check IAC valve for its resistance and operation. (Refer to p. 6E-70.) Is it in good condition?

YES

Check idle switch and its circuit. Are they in good condition?

YES

"O" wire shorted to ground. If wire is OK, substitute a known-good ECM and recheck.

NO

- Faulty idle switch,
- Maladjusted TP switch installation angle,
- Wire open or
- Poor connection.

NO

Faulty IAC valve.

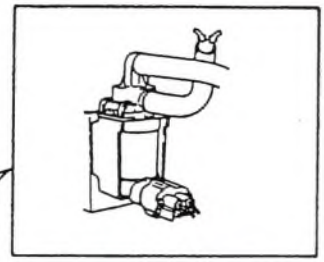
NO

1. Check that air intake system (including A/C SV valve is free from vacuum leakage.
2. Adjust duty and idle speed referring to p. 6E-59.

NOTE:
If not adjustable with idle speed adjusting screw, check fast idle air valve.

② LOW IDLE SPEED

1. Disconnect IAC valve hose from air cleaner case.
2. Then, is air drawn into it?



NO

Check IAC valve for its resistance and operation. (Refer to p. 6E-70.) Is it in good condition?

YES

- Clogged IAC valve hose,
- "O" wire open or
- Poor coupler connections.

If all above are OK, substitute a known-good ECM and recheck.

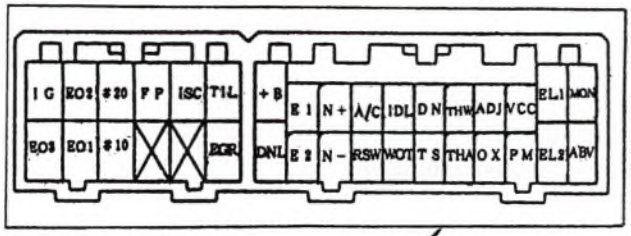
NO

Faulty IAC valve.

YES

Adjust duty and idle speed referring to p. 6E-59.

③ SYSTEM CIRCUIT CHECK



1. Disconnect ECM coupler with ignition switch OFF.
2. Is resistance between +B and ISC 22–26 Ω?

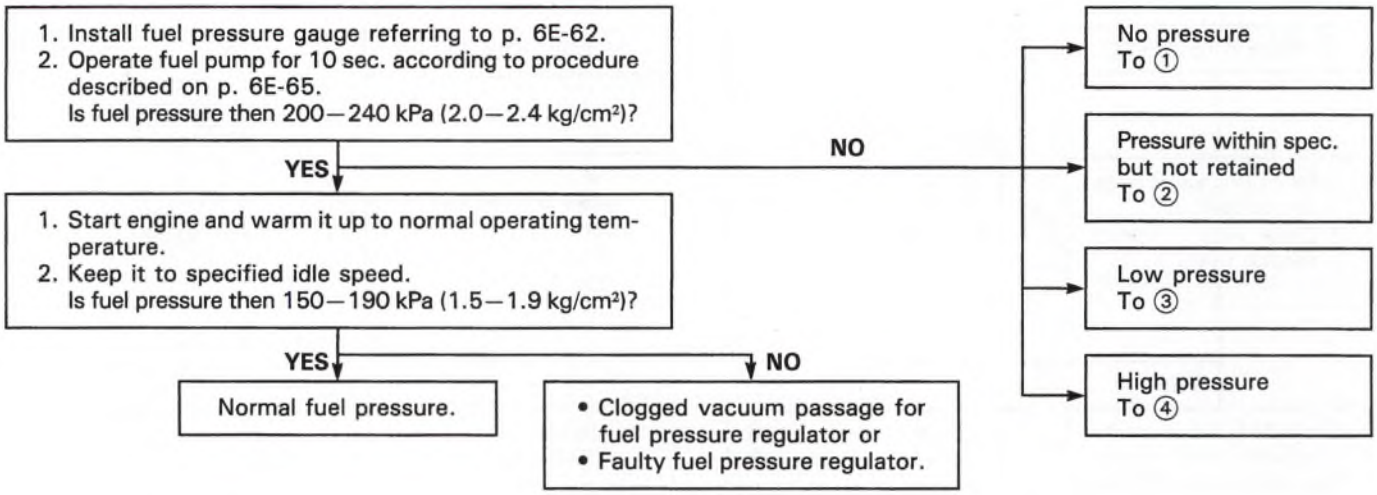
YES

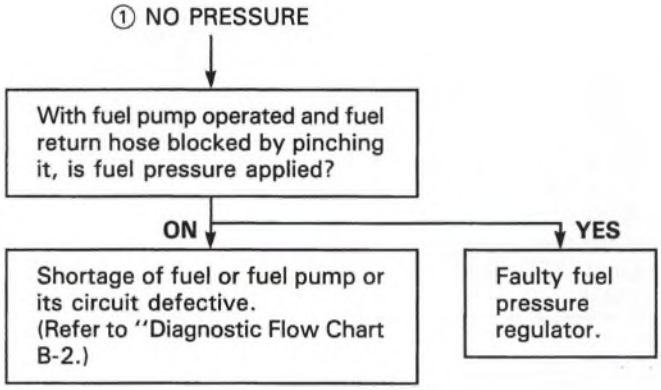
Poor coupler connection. If connection is OK, substitute a known-good ECM and recheck.

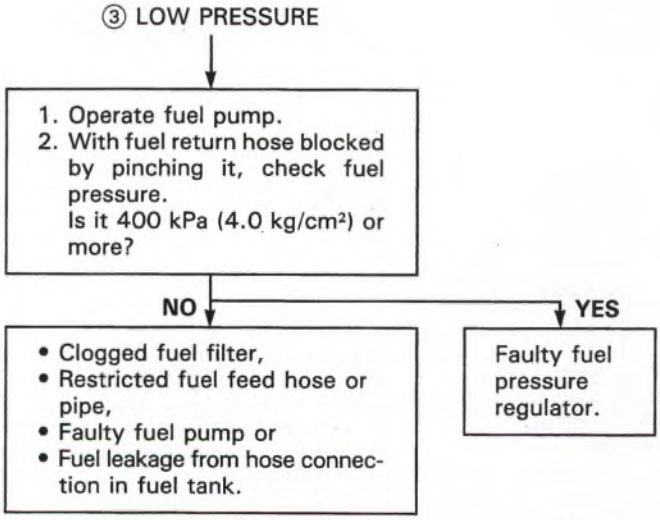
NO

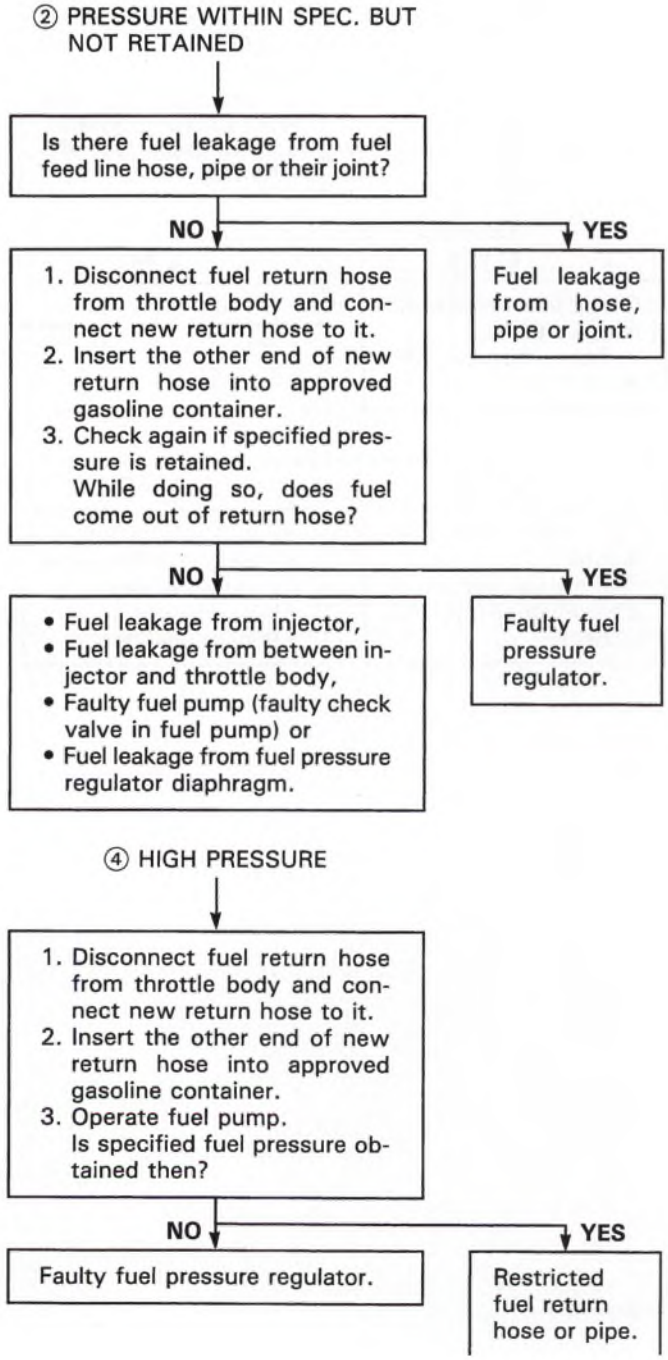
- Faulty IAC valve
- Poor coupler connection or
- Open wire harness

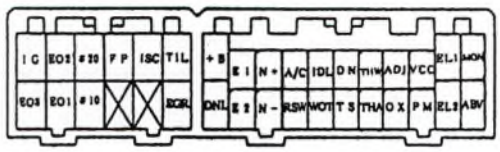
B-4 FUEL PRESSURE CHECK











ECM TERMINAL ARRANGEMENT

INSPECTION OF ECM AND ITS CIRCUITS

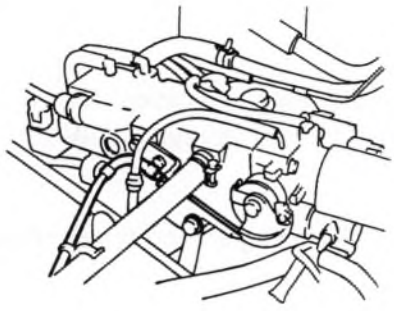
ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

CAUTION:
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with coupler disconnected from it.

NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
+B	Power source	10—14V	Ignition switch ON
N+	CMP sensor +	Indicator deflection repeated between 0V and about 5V	While engine running
N—	CMP sensor —	1V or less	Ignition switch ON
VCC	Power source of MAP sensor	About 5V	Ignition switch ON
PM	MAP sensor	About 2.6V	Ignition switch ON
IDL	Throttle position switch (Idle switch)	About 0V	Ignition switch ON Throttle valve at idle position
		About 5V	Ignition switch ON Throttle valve larger than idle position
WOT	Throttle position switch (Wide open throttle switch)	About 5V	Ignition switch ON Throttle valve at idle position
		About 0V	Ignition switch ON Throttle valve at full open position
RSW	Vehicle speed sensor	Indicator deflection repeated between 0V and about 10V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
TS	Test switch terminal	About 5V	Ignition switch ON
		About 0V	Ignition switch ON Test switch terminal grounded
DN	Diagnosis switch terminal	About 5V	Ignition switch ON
		About 0V	Ignition switch ON Diagnosis switch terminal grounded
A/C	A/C ON/OFF signal (If equipped)	10—14V	While engine running
		2V or less	While engine running A/C ON
ADJ	CO resistor	About 5V	No CO resistor
		About 0V	CO resistor terminals shorted

TERMINAL	CIRCUIT	NORMAL VOLATAGE	CONDITION
THA	IAT sensor	About 0.5V	Ignition switch ON Intake air temp.: 80°C
		About 2.4V	Ignition switch ON Intake air temp.: 20°C
THW	ECT sensor	About 0.5V	Ignition switch ON Engine coolant temp.: 80°C
		About 2.4V	Ignition switch ON Engine coolant temp.: 20°C
OX	Oxygen sensor	Refer to p. 6E-36, Code No.13.	
IG	Ignition coil	10—14V	Ignition switch ON
#20	Injector	10—14V	Ignition switch ON
#10	Injector	10—14V	Ignition switch ON
FP	Fuel pump relay	2V or less	For 5 seconds after ignition switch ON
		10—14V	When over 5 seconds after ignition switch ON
ISC	IAC valve	0.6—1.5V	Ignition switch ON
ABV	Air bypass valve	10—14V	Ignition switch ON
TIL	Turbocharger indicator light	10—14V	Ignition switch ON
DNL	Malfunction indicator light	2V or less	Ignition switch ON
		10—14V	While engine running
EGR	EGR SV valve	10—14V	Ignition switch ON
		2V or less	While racing after warm-up
EL1	Electric load switch (Blower fan)	10—14V	Ignition switch ON
		2V or less	Ignition switch ON Blower fan ON
EL2	Electric load switch (Radiator fan, rear defogger and small light)	2V or less	Ignition switch ON
		10—14V	Radiator fan, rear defogger or small light ON



ON-VEHICLE SERVICE

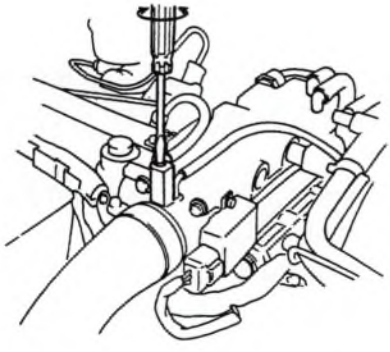
ACCELERATOR CABLE ADJUSTMENT

Check accelerator cable for play and adjust if necessary. Cable play should be within specification. If out of specification, loosen accelerator cable lock nut and adjust by turning adjusting nut. Be sure to tighten lock nut securely after adjustment.

Accelerator cable play

Throttle valve play when accelerator pedal fully depressed: 1—2 mm

Accelerator pedal play when throttle valve is closed: 6—8 mm



IDLE SPEED/IDLE CO/IDLE AIR CONTROL (IAC) DUTY ADJUSTMENT (INCLUDING A/C SV VALVE ADJUSTMENT)

Before idle speed/Idle CO/IAC duty check and adjustment, make sure to the following.

- Lead wires and hoses of Electronic Fuel Injection and engine emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Ignition timing is within specification.
- A/C is OFF, if equipped.
- All of electrical loads except ignition are switched off.

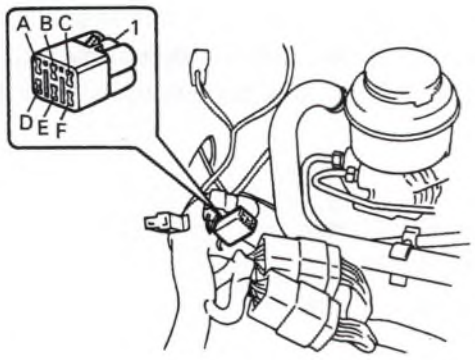
After above items are all confirmed, check idle speed, idle CO (%) and IAC duty as follows.

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral" and set parking brake and block drive wheels.

1) Warm up engine to normal operating temperature.
2) Set tachometer.
3) Check to ensure that idle speed is as specified. If idle speed is not within specified range, adjust it by turning idle speed adjusting screw.

Specified engine idle speed: 950 ± 50 r/min



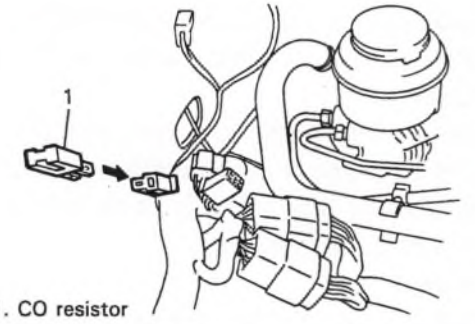
1. Monitor coupler

A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

4) Using service wires, ground "Diagnosis switch terminal" and "Test switch terminal" in monitor coupler so that ECM outputs A/F duty through "Duty output terminal".
5) Connect duty meter between "Duty output terminal" and "Ground terminal" of monitor coupler.
6) Check to ensure that A/F duty is within specification. And then disconnect service wires.

A/F duty: 60±5% (ON duty meter indication) or 8.4±0.7V when battery voltage is 14V

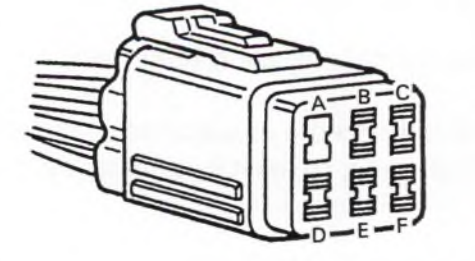
NOTE:
A/F duty can be checked by using analog type voltmeter.



1. CO resistor

7) If A/F duty is out of specification, replace CO resistor located at the right on dash panel (install a new one if there was none) and make adjustment. (As there are 8 types of CO resistors, adjustment is possible in 9 steps as including no resistor.)

CO concentration	Rich ← → Lean								
A/F duty (ON duty)	High ← → Low								
Resistor mark	R3	R2	R1	No resistor	L1	L2	L3	L4	L5

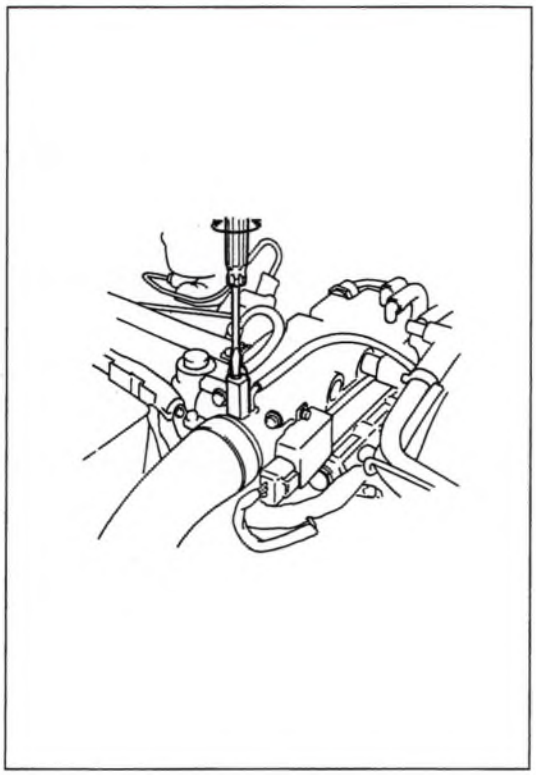


A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

8) Using service wire, ground "Diagnosis switch terminal" in monitor coupler so that ECM output IAC duty through "Duty output terminal".
9) Connect duty meter between "Duty output terminal" and "Ground terminal" of monitor coupler.
10) Check to ensure that idle speed and IAC duty are as specified. If IAC duty and/or idle speed is not within specified range, adjust it by turning idle speed adjusting screw. And then disconnect service wire.

Specified engine idle speed:
950±50 r/min

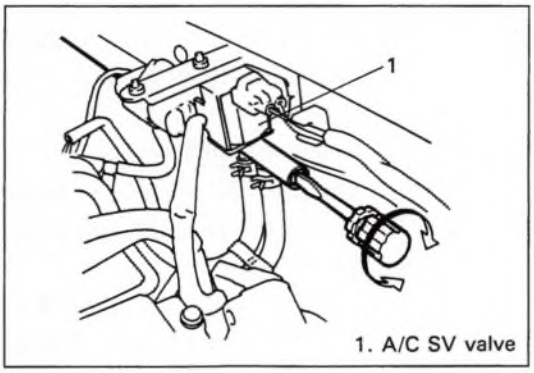
IAC duty at specified idle speed:
35±5% (ON duty meter indication) or 4.9±0.7V when battery voltage is 14V.



11) This step is for checking and/or adjusting engine idle speed and IAC duty when A/C is working.
 ① Turn A/C switch ON and set heater blower switch to high (max.) speed position.
 ② Using service wire, ground "Diagnosis switch terminal" in monitor coupler.
 ③ Check that diagnostic trouble code No.56 is output from malfunction indicator light while A/C compressor is operating.
 If it is not, check A/C system, referring to flow chart of "Code No. 56 A/C NORMAL OPERATING SIGNAL CIRCUIT" in p. 6E-48.
 ④ Check to ensure that idle speed and IAC duty are specification respectively.

Specified engine idle speed with A/C ON:
1050 ± 50 r/min

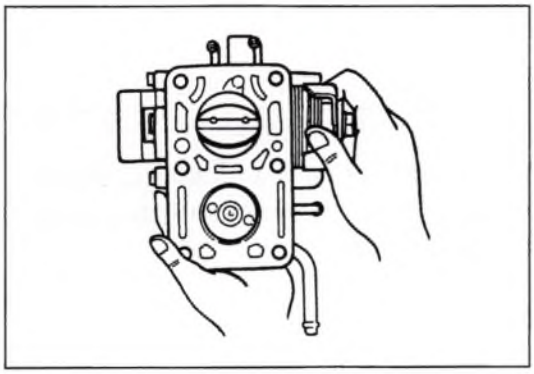
IAC duty at specified idle speed with A/C ON:
35 ± 5% (ON duty meter indication) or 4.9 ± 0.7V when battery voltage is 14V.



1. A/C SV valve

 ⑤ If idle speed and/or IAC duty is not within specified range, adjust it by turning adjusting screw of A/C SV valve.

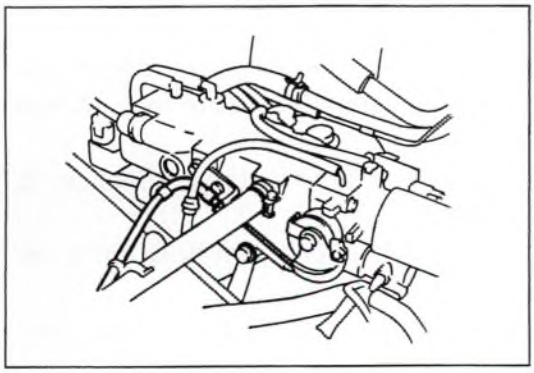
12) Upon completion of adjustment, disconnect service wire from monitor coupler and install cap to monitor coupler.



THROTTLE BODY

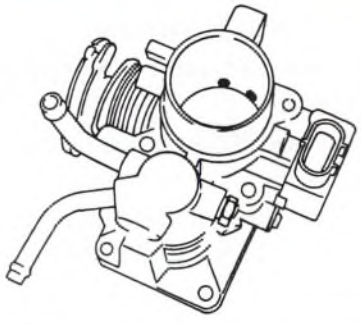
Inspection

- Check that throttle valve lever moves smoothly.
- Vacuum passage inspection.
 With finger placed against vacuum nozzle, increase engine speed a little and check that vacuum is applied.



Removal

1) Disconnect battery negative cable at battery.
2) Disconnect accelerator cable from throttle body.
3) Drain cooling system.
4) Disconnect TP switch coupler.
5) Disconnect vacuum hoses and engine cooling water hoses from throttle body.
6) Remove throttle body.



Cleaning

Clean passages by blowing compressed air.

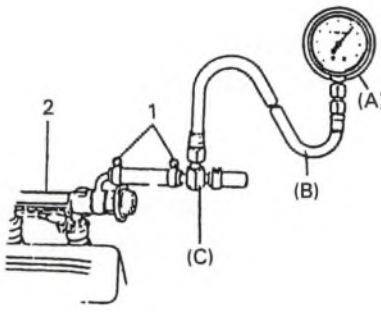
NOTE:

Dont put drill or wire into passages for cleaning. It causes damage in passages.

Installation

Install in reverse order of removal procedure noting following points.

- Use new gasket.
- Clamp hoses securely.



1. Clamp
2. Fuel delivery pipe

FUEL PRESSURE INSPECTION

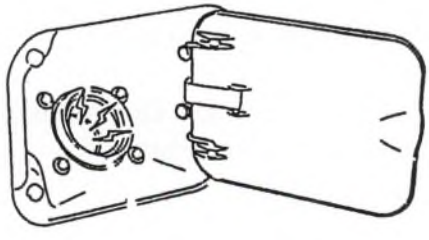
1) Relieve fuel pressure according to procedure described on p. 6-4.
2) Disconnect fuel feed hose from fuel delivery pipe.
3) Connect special tools between fuel delivery pipe and fuel feed hose, and clamp hoses securely to ensure no leak occurs during checking.

 Special Tool
 (A): 09912-58441
 (B): 09912-58431
 (C): 09912-58490

4) Connect fuel pump relay with ignition switch OFF, and then turn ON ignition switch (Without starting engine).
5) Measure fuel pressure.

 Fuel pressure: 220 ± 20 kPa (2.2 ± 0.2 kg/cm²)

 If measured pressure doesn't satisfy specification, refer to "Diagnostic Flow Chart B-4" and check each possibly defective part. Replace if found defective.
6) Check that fuel pressure does not drop quickly even if it is left as it is for some time. If fuel pressure drops, check for fuel leakage.

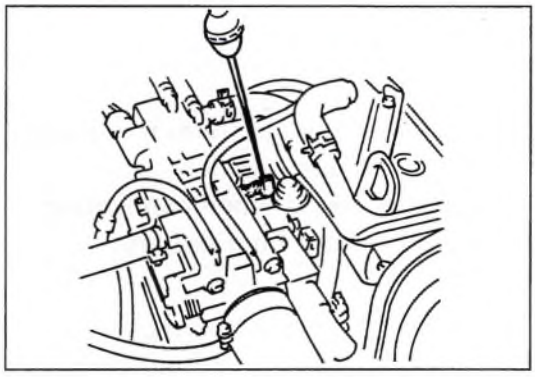


FUEL PUMP

Inspection

WARNING:
When fuel filler cap is removed in any procedure, work must be done with no smoking, in a well-ventilated area and away from any open flames.

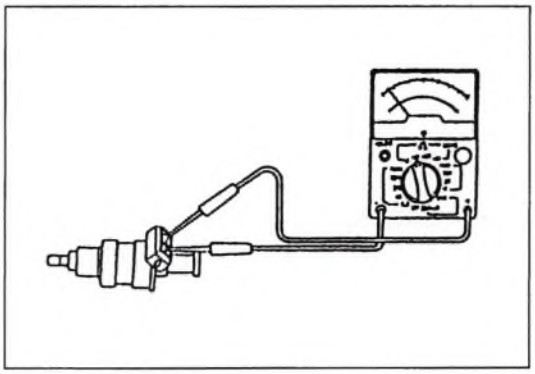
1) Remove filler cap and turn ON ignition switch.
 Then fuel pump operating sound should be heard from fuel filler for about 5 seconds and stop. Be sure to reinstall fuel filler cap after checking.
 If above check result is not satisfactory, advance to "Diagnostic Flow Chart B-2".
2) Fuel pressure should be felt at fuel return hose for 5 seconds after ignition switch ON.
 If fuel pressure is not felt, advance to "Diagnostic Flow Chart B-4".



FUEL INJECTOR

On-Vehicle Inspection

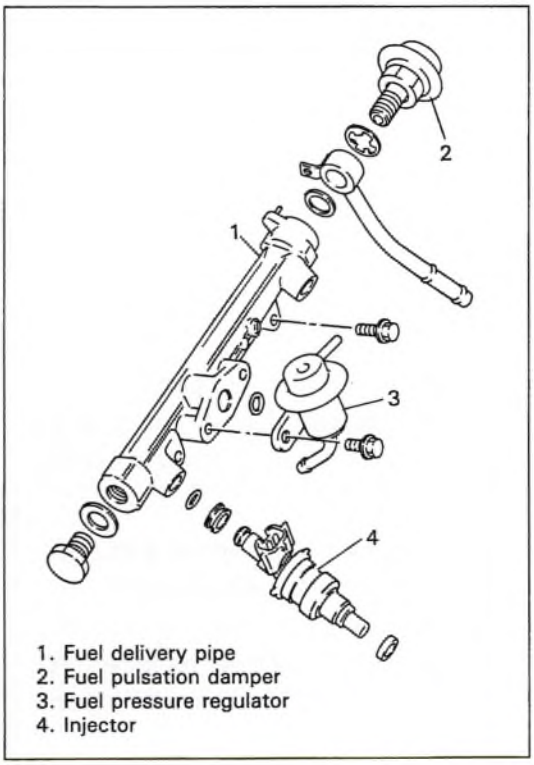
1) Using sound scope or such, check operating sound of injector when engine is running or cranking.
 Cycle of operating sound should vary according to engine speed.
 If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector.



2) Disconnect coupler from injector, connect ohmmeter between terminals of injector and check resistance.
 If resistance is out of specification, replace.

 Resistance of injector: 13.1—14.5 Ω

3) Connect coupler to injector assembly.



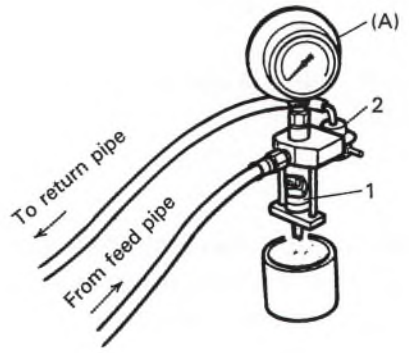
1. Fuel delivery pipe
2. Fuel pulsation damper
3. Fuel pressure regulator
4. Injector

Removal

1) Relieve fuel pressure according to procedure described on p. 6-4.
2) Disconnect battery negative cable at battery.
3) Disconnect fuel hoses (fuel feed and return hoses) and vacuum hose from delivery pipe.
4) Disconnect coupler from each injector.
5) Remove fuel delivery pipe with fuel injectors.

 NOTE:
 Be careful not to drop injectors.

6) Remove injectors from delivery pipe.



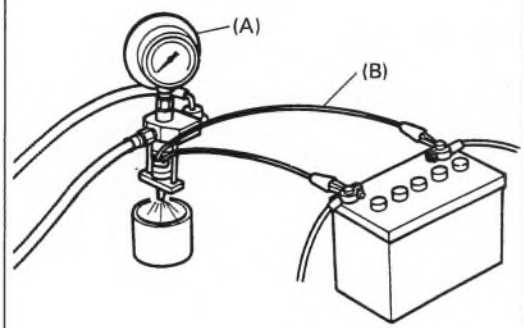
1. Injector
2. Pressure regulator

Inspection

WARNING:
As fuel is injected in this inspection, perform in a well ventilated area and away from open flames.
Use special care to prevent sparking when connecting and disconnecting test lead to and from battery.

1) Install injector to special tool (injector holder).
2) Connect special tool and fuel pipes (fuel feed pipe and return pipe) of vehicle with fuel hoses (special tool). Clamp them securely.

Special Tool
(A): 09912-58420



3) Connect special tool (injector test lead) to injector.

Special Tool
(A): 09912-58420
(B): 09930-88530

4) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
5) Put graduated cylinder under injector.
6) Operate fuel pump according to procedure described below.
7) Check fuel hose connections for fuel leakage.
8) Connect injector test lead to battery for 15 seconds and measure injected fuel volume with graduated cylinder.

WARNING:
When connecting or disconnecting lead wire to battery which actuates injector, spark is emitted and fuel or its vapor from injector may catch fire. To prevent such a danger, keep injector and cylinder as far apart as possible from battery, electric devices and open flames.

Test each injector two or three times.
If not within specification, replace injector.

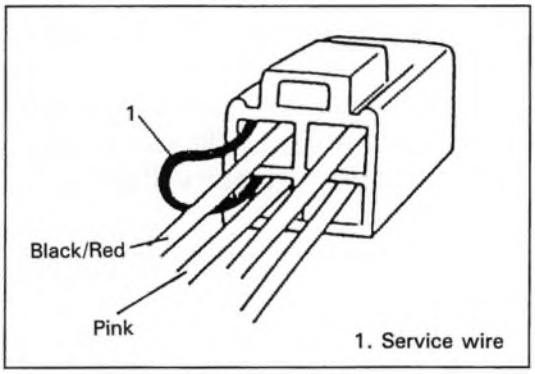
Injected fuel volume: 43—55 cc/15 sec.

9) After checking injection volume, check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work).

If fuel leaks more than following specification, replace.

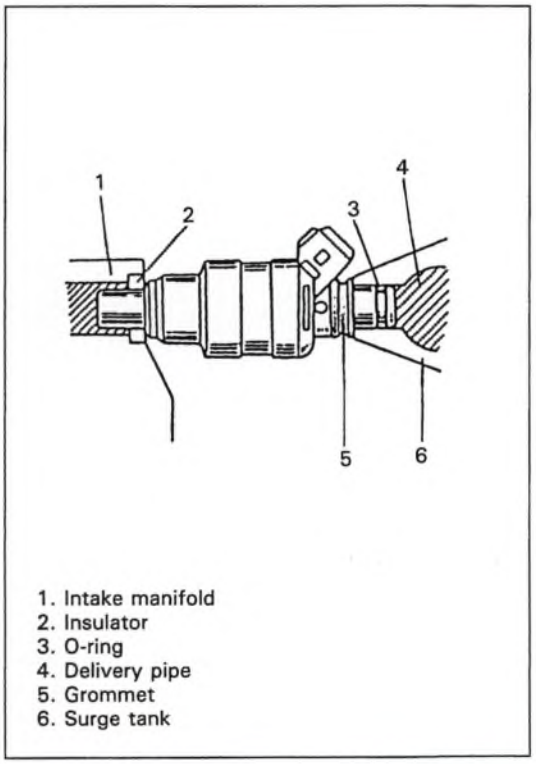
Fuel leakage: Less than 1 drop/ 3 min.

10) In the same way, also check injection volume and leakage of other 2 injectors.
11) Disconnect service wire from fuel pump relay. Then release fuel pressure in fuel feed line by actuating injector.
12) Remove special tool from injectors and fuel delivery pipe.



1. Service wire

- To operate fuel pump, connect Pink and Black/Red wire terminals by using service wire and then turn ON ignition switch.



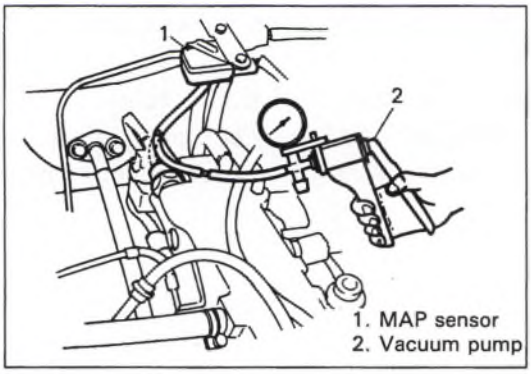
1. Intake manifold
2. Insulator
3. O-ring
4. Delivery pipe
5. Grommet
6. Surge tank

Installation

Install in reverse order of removal procedure noting followings.

- Replace injector O-ring and insulator with new ones using care not to cause damage to them.
- Apply thin coat of fuel to O-rings and then install injectors into delivery pipe.
- After installation, with engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.
- Tighten delivery pipe bolts to specified torque.

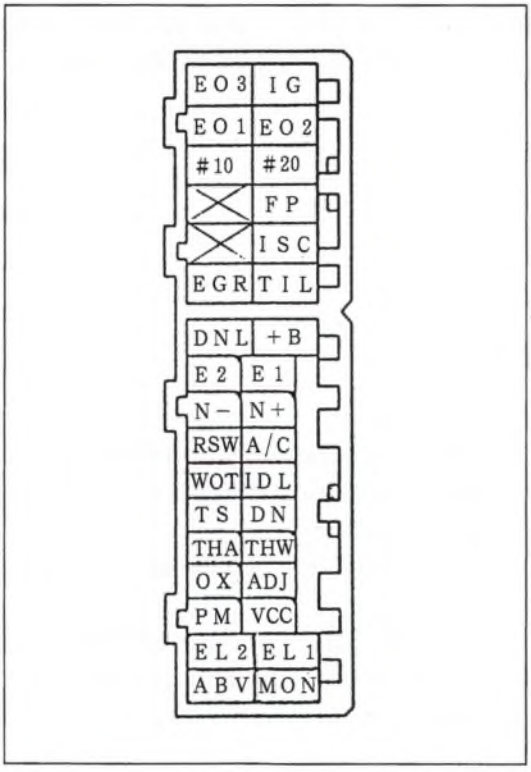
Tightening Torque for delivery pipe bolts
18—28 N·m (1.8—2.8 kg-m)



MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

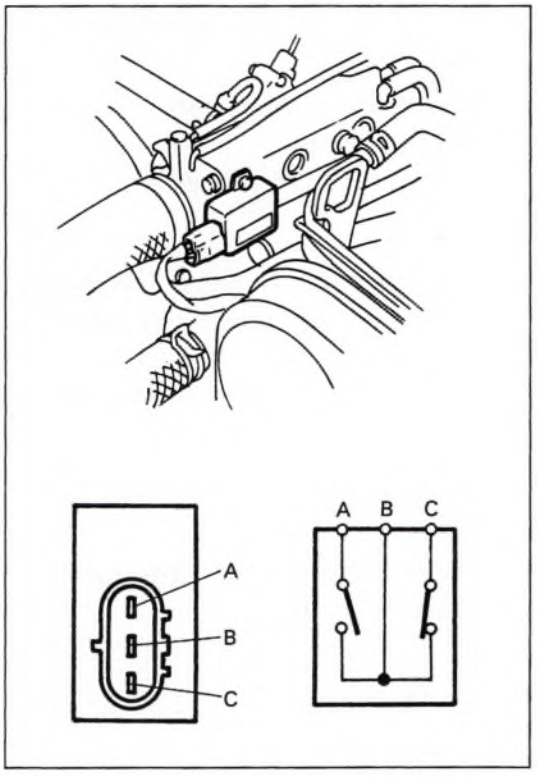
Inspection

1) Disconnect MAP sensor vacuum hose from surge tank and connect vacuum pump to vacuum hose disconnected.



2) Connect voltmeter between PM terminal and E2 terminal of ECM coupler.
3) With ignition ON, apply vacuum to MAP sensor gradually from vacuum pump and check voltage indicated on sensor. Sensor is in good condition if output voltage is as follows.

Vacuum (mmHg)	0	300	600
Voltage (V)	2.6	1.9	1.2



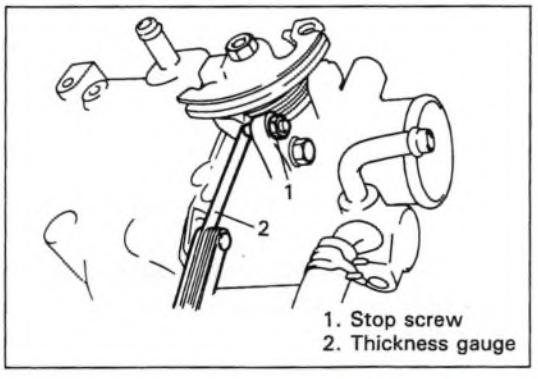
THROTTLE POSITION SWITCH (TP SWITCH)

Inspection

1) Disconnect negative cable at battery.
2) Disconnect coupler from TP switch.
3) Using ohmmeter, check resistance between terminals under each condition given in table below.

Terminal	Condition	Resistance
B—C (Idle)	Throttle valve is at idle position	0—500 Ω
	Throttle valve is not at idle position	∞
A—B (Wide open throttle)	Throttle valve is fully opened	0—500 Ω
	Throttle valve is not fully opened	∞

If idle switch check result is not satisfactory, adjust installation angle of TP switch and if found defective in the other check, replace TP switch.

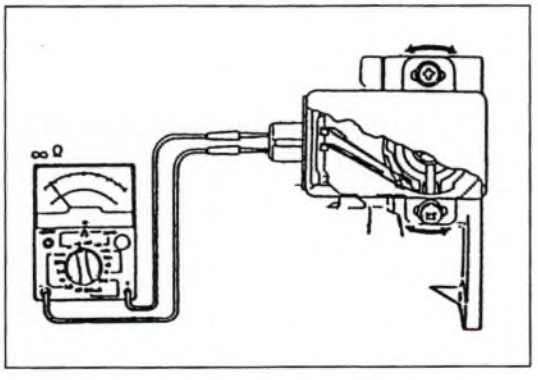


1. Stop screw
2. Thickness gauge

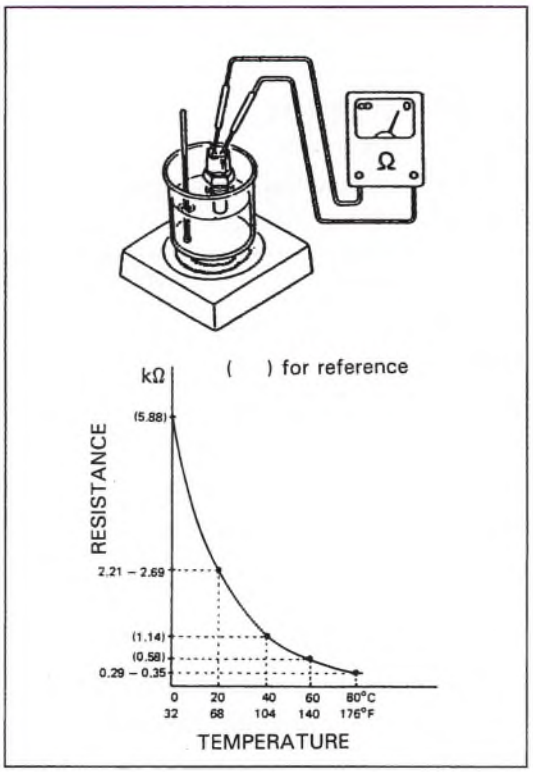
Adjustment

1) Disconnect battery negative cable and disconnect TP switch coupler.
2) Insert 0.5 mm thickness gauge between throttle stop screw and throttle lever.

CAUTION:
As throttle stop screw is factory adjusted precisely, don't remove or adjust it.



3) Loosen TP switch.
4) Connect ohmmeter between B and C terminals.
5) First, turn TP switch counterclockwise fully and then clockwise gradually to find position where ohmmeter reading changes from continuity to no continuity. Then fix TP switch at that position by tightening screws.



INTAKE AIR TEMPERATURE SENSOR (IAT SENSOR)

Removal

1) Disconnect battery negative cable at battery.
2) Disconnect coupler from IAT sensor.
3) Remove IAT sensor and gasket from surge tank.

Inspection

Immerse temperature sensing part of IAT sensor in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in left figure, replace IAT sensor.

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of IAT sensor and surge tank.
- Tighten IAT sensor to specified torque.

Tightening Torque
(a): 20—25 N·m (2.0—2.5 kg-m)

- Connect IAT sensor coupler securely.

ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

Removal

1) Disconnect battery negative cable at battery.
2) Drain coolant referring to Section 6B.

> **WARNING:**
> **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

3) Disconnect coupler from ECT sensor.
4) Remove ECT sensor and gasket from throttle body.

Inspection

Check resistance of ECT sensor variable with temperature by using the same checking method as IAT sensor.
For ECT sensor characteristic, refer to the above figure.
If found defective, replace.

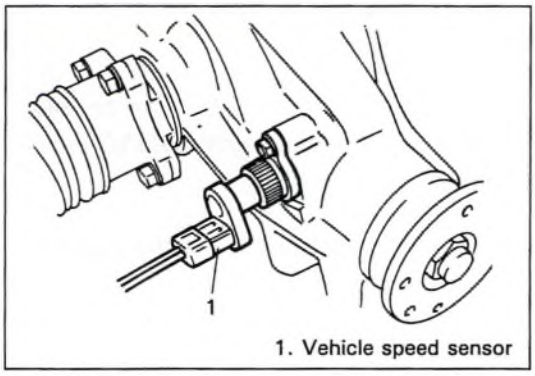
Installation

Reverse removal procedure noting the following

- Clean mating surfaces of ECT sensor and throttle body.
- Check gasket for damage and repalce if necessary.
- Tighten ECT sensor to specified torque.

Tightening Torque
(a): 15—20 N·m (1.5—2.0 kg-m)

- Connect coupler to ECT sensor securely.
- Refill coolant.

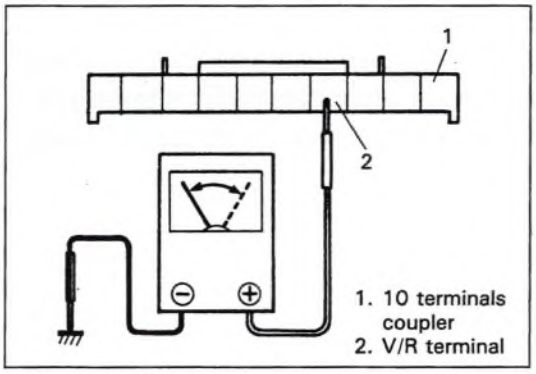


1. Vehicle speed sensor

VEHICLE SPEED SENSOR (VSS)

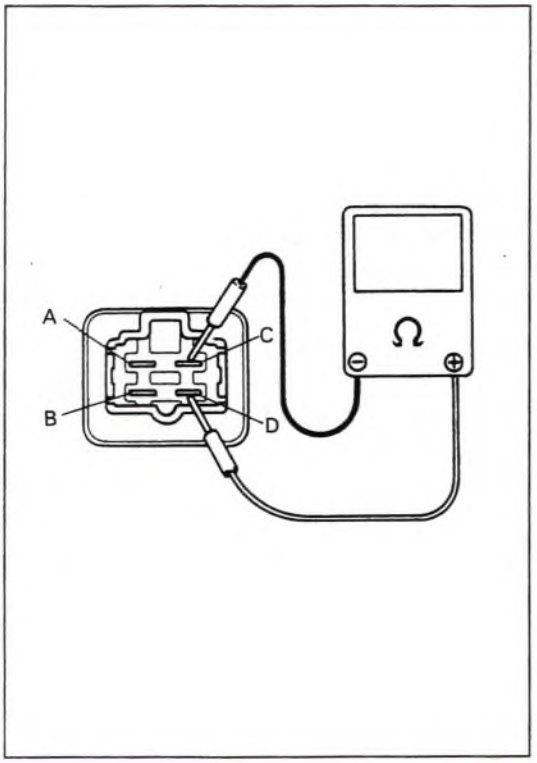
Inspection

1) Remove vehicle speed sensor from differential.



1. 10 terminals coupler
2. V/R terminal

2) Disconnect 10 terminal coupler and connect voltmeter between "V/R" wire terminal of disconnected coupler and body ground.
3) Turn vehicle speed sensor with ignition switch ON. Voltmeter indicator should move back and forth between 0 and 12V 4 times while vehicle speed sensor is turned one full revolution.
4) Replace speed sensor, if check result is not satisfactory.

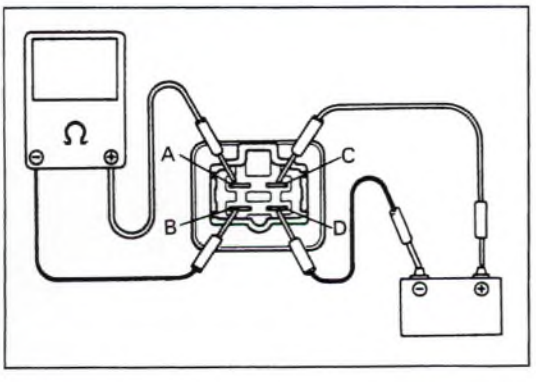


ECM MAIN/FUEL PUMP RELAY

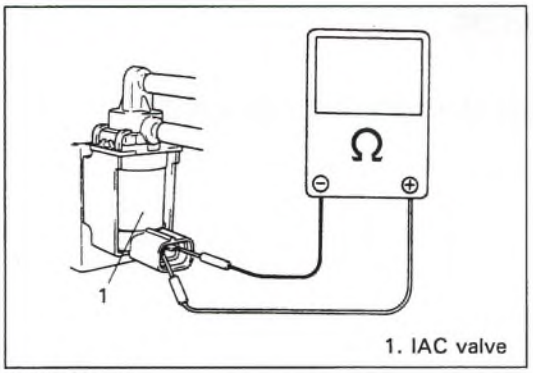
Inspection

1) Disconnect negative cable at battery.
2) Remove ECM main/fuel pump relay from main fuse box after disconnecting its coupler.
3) Check resistance between each two terminals as in table below.
 If check results are as specified, proceed to next operation check. If not, replace.

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	60—80 Ω



4) Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D". If found defective, replace.
5) Install the relay and connect its coupler securely.



64B40-6E-91-1

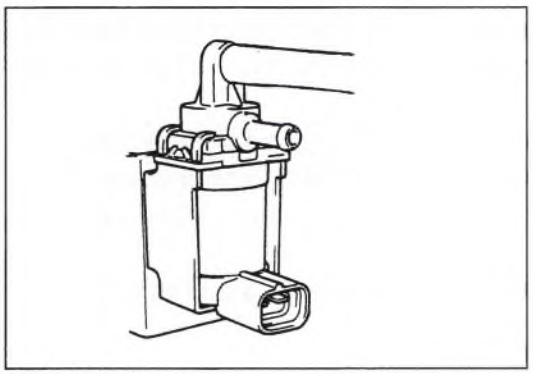
IDLE AIR CONTROL VALVE (IAC VALVE)

Inspection

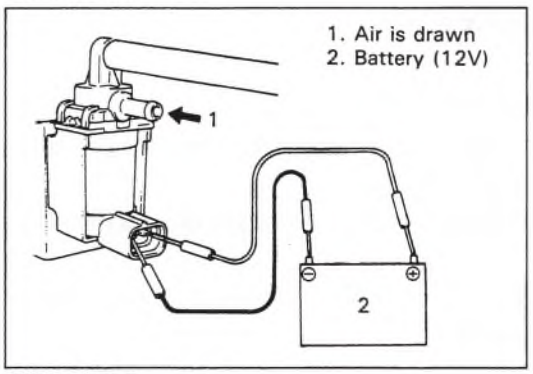
1) With ignition switch "OFF", disconnect IAC valve coupler.
2) Check resistance between each two terminals of IAC valve.

Resistance: 22—26 Ω

If it is within specification, proceed to next operation check. If not, replace.


64B40-6E-91-2

3) Warm up engine to normal operating temperature.
4) With engine running and IAC valve coupler disconnected, disconnect IAC valve hose of underside as shown left. In this state, check that air is not drawn into the IAC valve.

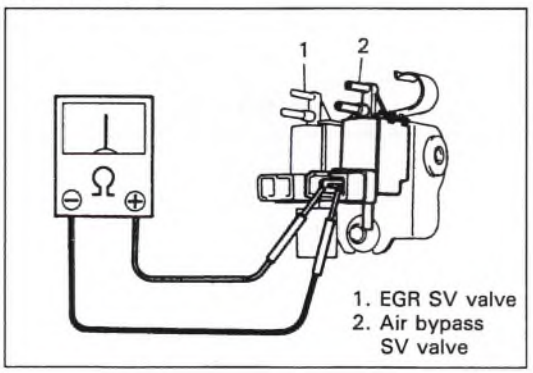


64B40-6E-91-3

5) Under above condition, connect 12V-battery to IAC valve terminals and check that air is drawn into the IAC valve. If check result is not satisfactory, replace IAC valve.

> **CAUTION:**
> **Do not apply battery voltage to IAC valve for longer than 1 second. Applying battery for longer than 1 second may cause solenoid to burn.**

6) Connect hose and coupler securely.

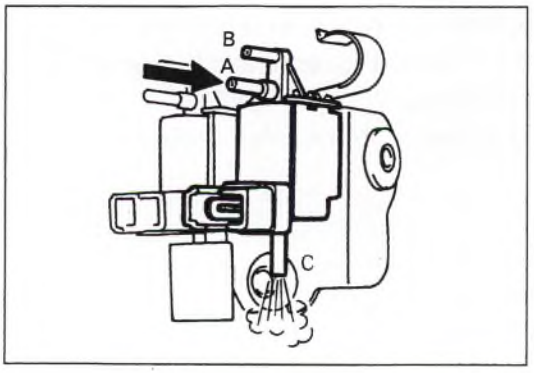


AIR BYPASS SOLENOID VACUUM VALVE (AIR BYPASS SV VALVE)

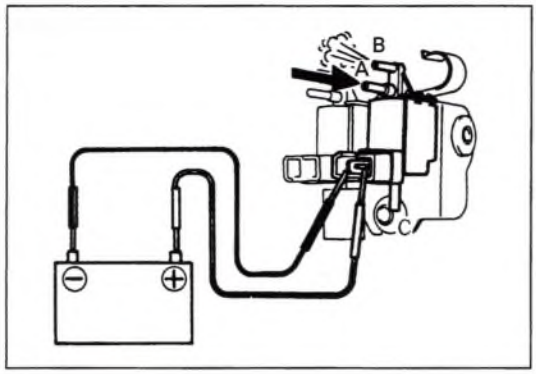
1) With ignition switch OFF, disconnect coupler from SV valve.
2) Check resistance between two terminals of SV valve.

Resistance of air bypass SV valve: 37—44 Ω

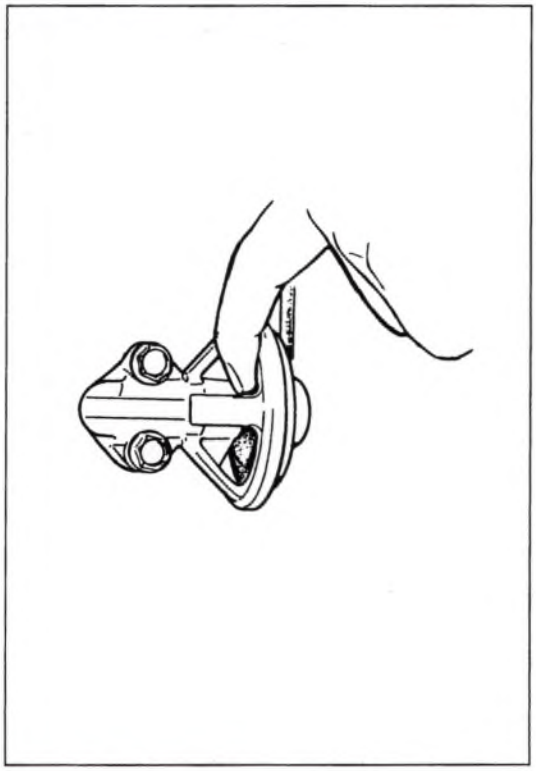
If resistance is as specified, proceed to next operation check. If not, replace.



3) Blow into nozzle "A". Air should come out of nozzle "C" and not out of nozzle "B".



4) Connect 12V-battery to SV valve terminals. In this state, blow nozzle "A".
 Air should come out of nozzle "B" and not out of nozzle "C".
 If check result is not as described above, replace air bypass SV valve.
5) Connect vacuum hoses.
6) Connect SV valve coupler securely.



EGR SYSTEM

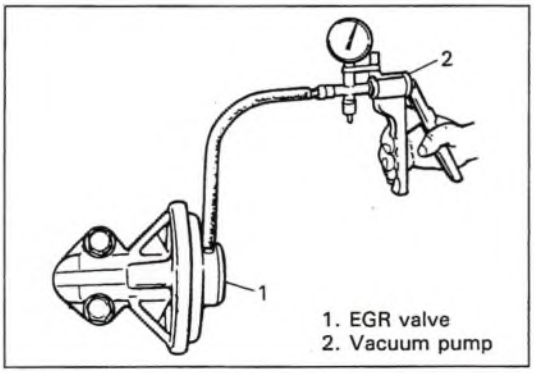
System Inspection

NOTE:
Make sure that M/T is set in "Neutral" and that parking brake lever is pulled all the way up.

1) When engine is cool (coolant temeprature is below 60°C, race engine and check that EGR valve diaphragm is not operating in nthis state, by touching diaphragm with finger.

> **CAUTION:**
> **If EGR valve is hot, it may be necessary to wear gloves to avoid burning fingers.**

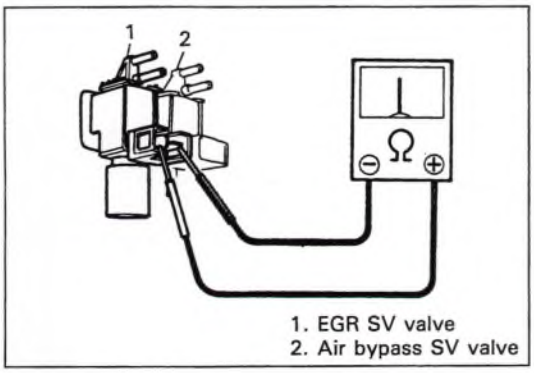
2) Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves.
 If EGR valve fails to operate properly, check vacuum hoses, EGR valve, SV valve, wire harness and ECM.
3) Keep engine running at idle speed and open EGR valve by hand, and engine should either stop or reduce its speed. If neither occurs, EGR passage is clogged. Clean it.



1. EGR valve
2. Vacuum pump

EGR Valve Inspection

1) Disconnect vacuum hose from EGR modulator.
2) Connect vacuum pump gauge to its hose.
3) Check that EGR valve diaphragm moves smoothly and that it is held at the same position when 20 cmHg vacuum is applied to EGR valve.
 If diaphragm fails to move smoothly, or it isn't held at the same position, replace EGR valve.
4) After checking, be sure to connect vacuum hose.



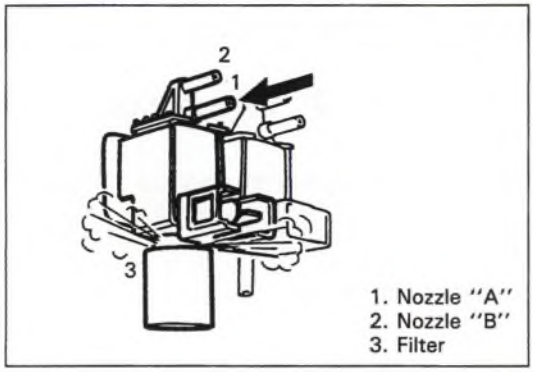
1. EGR SV valve
2. Air bypass SV valve

EGR Solenoid Vacuum Valve (EGR SV Valve) Inspection

1) With ignition switch OFF, disconnect coupler from SV valve.
2) Check resistance between two terminals of SV valve.

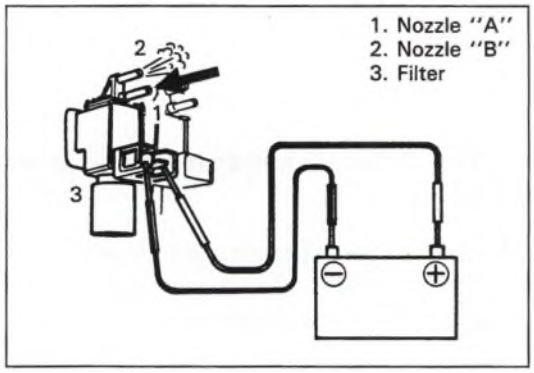
 Resistance: 37—44 Ω

 If resistance is as specified, proceed to next operation check. If not, replace.



1. Nozzle "A"
2. Nozzle "B"
3. Filter

3) Disconnect vacuum hoses from EGR modulator and throttle body.
4) Blow into nozzle "A". Air should come out of filter and not out of nozzle "B".



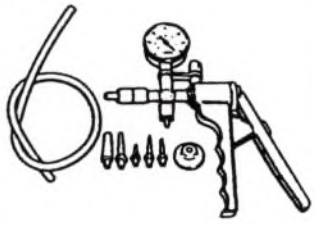
1. Nozzle "A"
2. Nozzle "B"
3. Filter

5) Connect 12V-battery to SV valve terminals. In this state, blow nozzle "A".
 Air should come out of nozzle "B" and not out of filter. If check result is not as described above, replace EGR SV valve.
6) Connect SV valve coupler securely.
7) Connect vacuum hose securely.

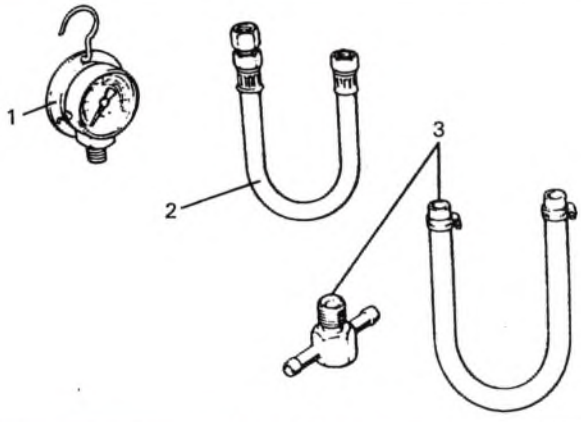
RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque	
	N·m	kg-m
Throttle body bolts and nuts	18—28	1.8—2.8
Fuel delivery pipe bolts	18—28	1.8—2.8
TP sensor screws	3.5	0.35
ECT sensor	15—20	1.5—2.0
Oxygen sensor	45—55	4.5—5.5
IAT sensor	20—25	2.0—2.5

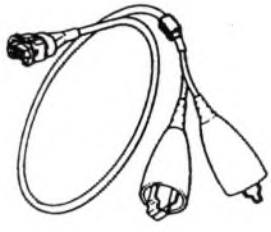
SPECIAL TOOLS



09917-47910
Vacuum pump gauge



1. 09912-58441
 Fuel pressure gauge
2. 09912-58431
 Pressure hose
3. 09912-58490
 3-way joint & hose



09930-88520
Injector test lead

SECTION 6F

IGNITION SYSTEM

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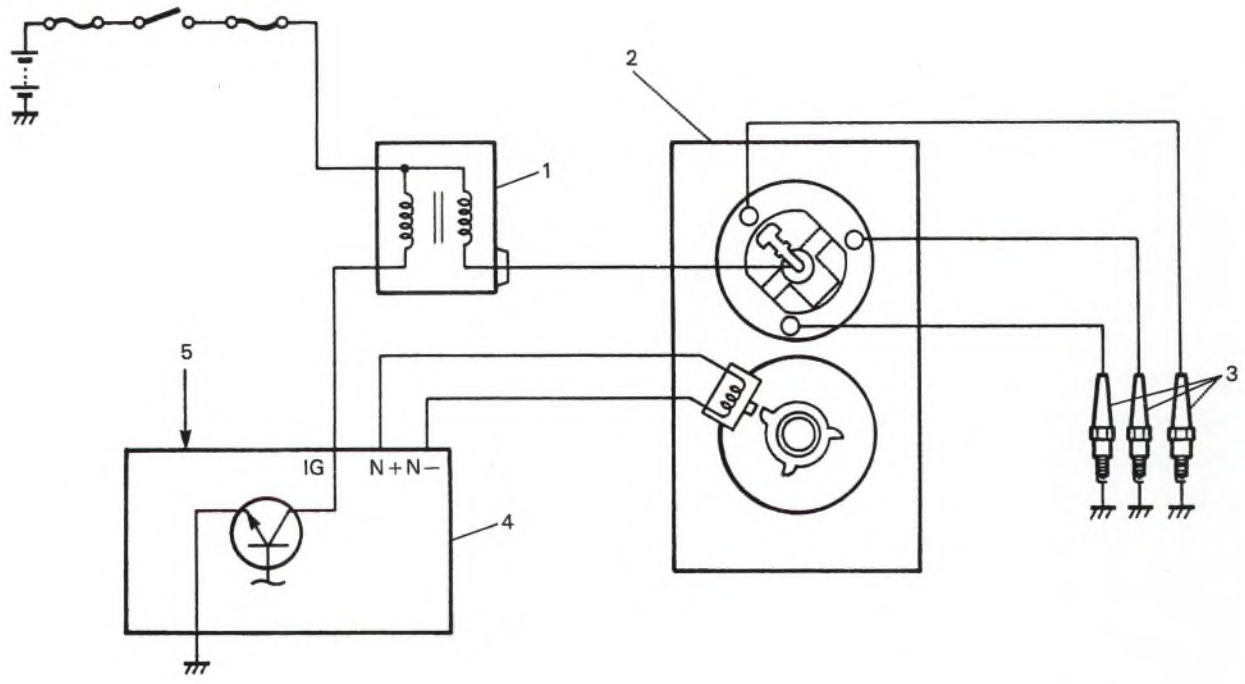
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GENERAL DESCRIPTION

The ignition system used for this vehicle has an ESA (Electronic Spark Advance) system and consists of the following parts.

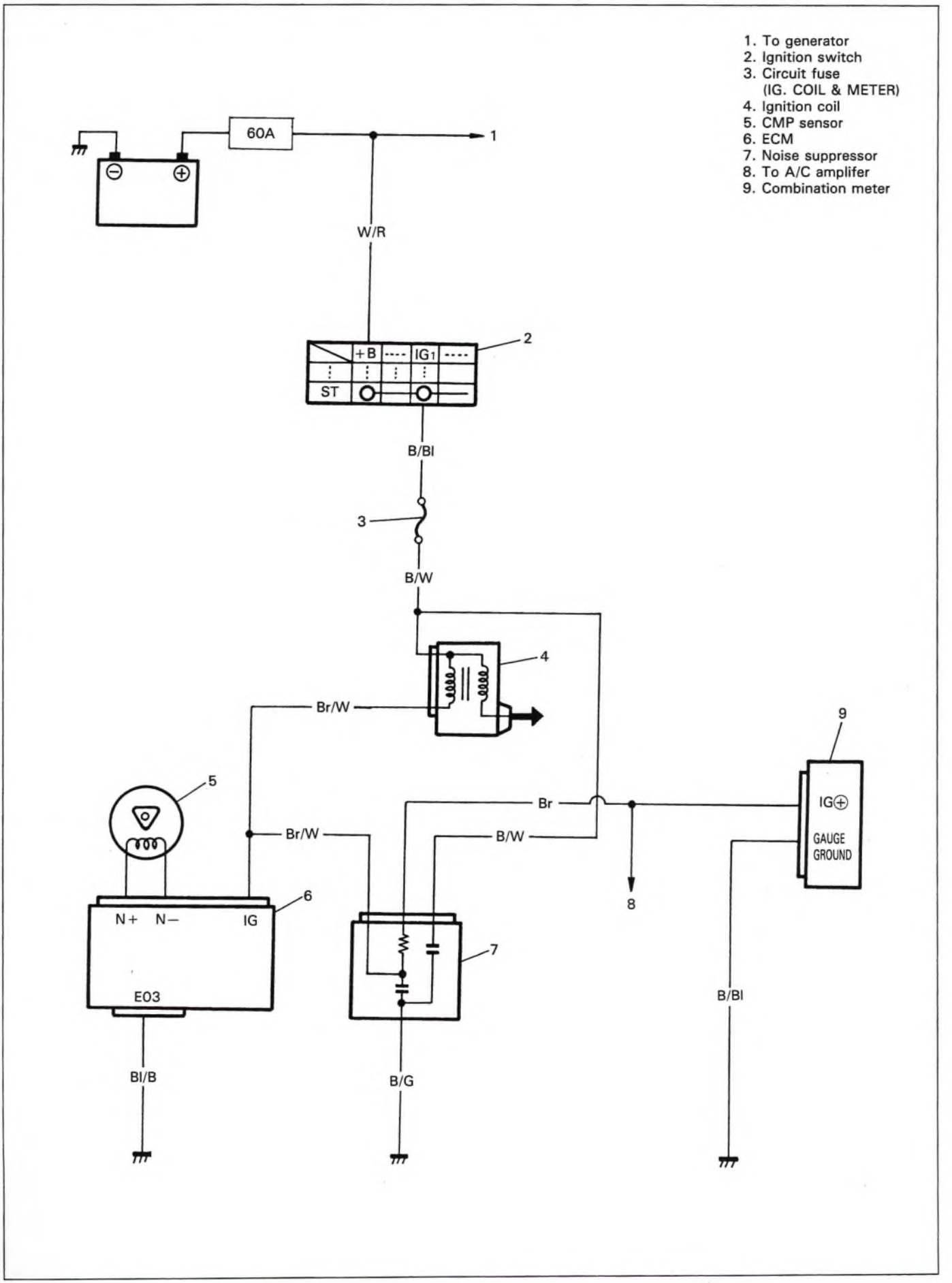
- ECM
 It detects the engine condition through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and turns ON and OFF the primary current of the ignition coil.
- Ignition coil
 When the ignition coil primary current is turned OFF, a high voltage is induced in the secondary winding.
- Distributor
 It distributes a high voltage current to each plug.
- High-tension cords and spark plugs.
- CMP Sensor (Camshaft Position Sensor)
 Located in the distributor, it converts the crank angle into voltage variation and sends it to ECM. For its details, refer to Section 6E.
- MAP sensor, TP switch, ECT sensor and test switch terminal.
 For their details, refer to Section 6E.

In ESA system, the ECM is programmed for the best ignition timing under every engine condition. Receiving signals which indicate the engine condition from the sensors, e.g., engine revolution, intake air pressure, coolant temperature, etc., it selects the most suitable ignition timing from its memory and operates the ignitor in the ECM. Thus ignition timing is controlled to yield the best engine performance.
For more information, refer to Section 6E.



1. Ignition coil
2. Distributor
3. Spark plug
4. ECM
5. From various sensors

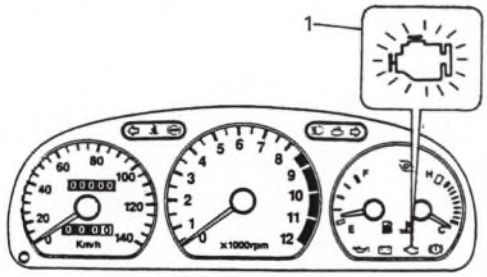
WIRING CIRCUIT



DIAGNOSIS

Condition	Possible Cause	Correction
Engine cranks, but will not start or hard to start	**No spark**	
	• Blown fuse for ignition coil	Replace
	• Loose connection or disconnection of lead wire or high-tension cord(s)	Connect securely
	• Faulty high-tension cord(s)	Replace
	• Faulty spark plug(s)	Adjust, clean or replace
	• Cracked rotor or cap	Replace
	• Maladjusted signal rotor air gap	Adjust
	• Faulty ignition coil	Replace
	• Faulty noise suppressor	Replace
	• Faulty CMP sensor	Replace
	• Faulty ignitor (in ECM)	Replace
	• Faulty ECM	Replace
	Maladjusted ignition timing	Adjust
Power fuel economy or engine performance	• Incorrect ignition timing	Adjust
	• Faulty spark plug(s) or high-tension cord(s)	Adjust, clean or replace
	• Faulty ECM	Replace

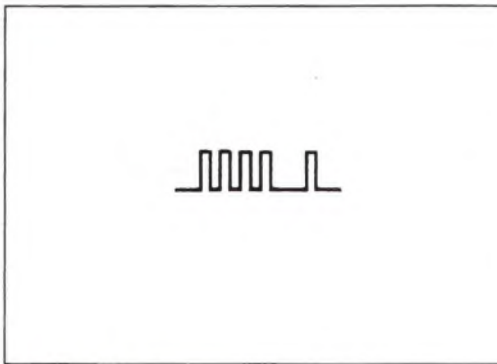
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1. Malfunction indicator lamp

ON-BOARD DIAGNOSTIC SYSTEM (SELF-DIAGNOSIS)

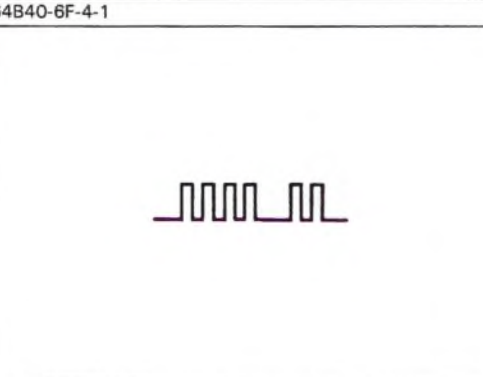
1) To insure correct diagnosis, check to confirm that battery voltage is within standard value when engine is standstill.
2) Turn on ignition switch and make sure that malfunction indicator lamp.
3) If engine will not start but cranking is possible, crank it for more than 2 seconds.
4) While ignition switch is ON, ground diagnosis switch terminal in monitor coupler and then read diagnostic trouble code.



64B40-6F-4-1

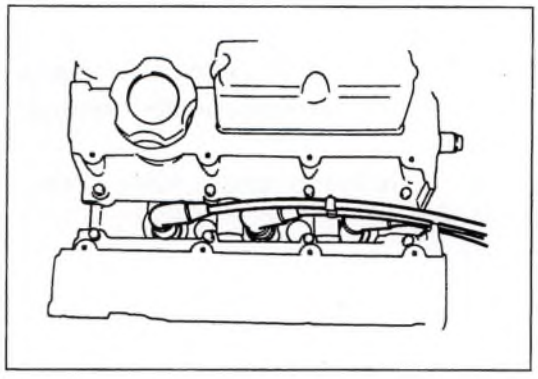
DIAGNOSTIC TROUBLE CODE NO.41

ECM indicates that no ignition signal is inputted while engine is running or being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No.41" in Section 6E.



DIAGNOSTIC TROUBLE CODE NO.42

ECM memory indicates that no CMP sensor signal has been experienced for more that 2 seconds while engine is being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No.42" in Section 6E.

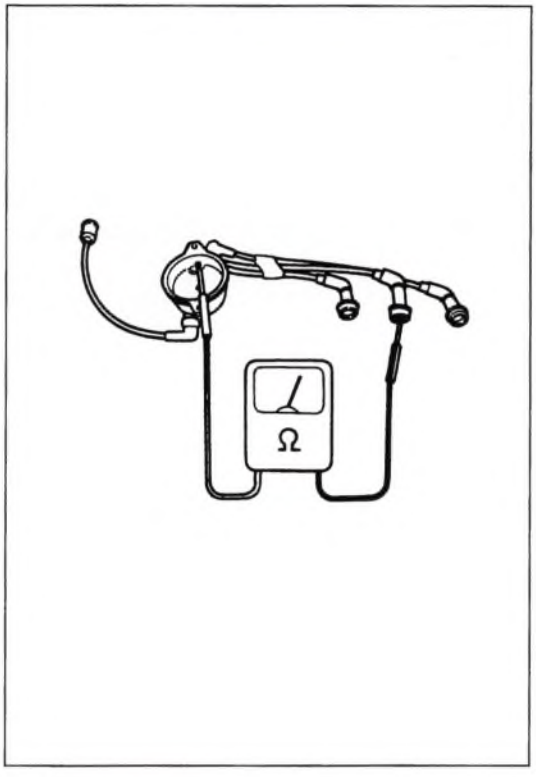


ON-VEHICLE SERVICE

HIGH-TENSION CORDS

1) Remove breather pipe bolts (3 pcs.) and camshaft housing cover.
2) Remove high-tension cord at ignition coil while gripping its cap.
3) Remove distributor cap installed with high-tension cords.
4) Remove high-tension cord clamp from cylinder head cover.
5) Pull out high-tension cords from spark plugs while gripping each cap.

CAUTION:
- **Removal of high-tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).**
- **For the same reason, pull out each connection by gripping cap portion.**



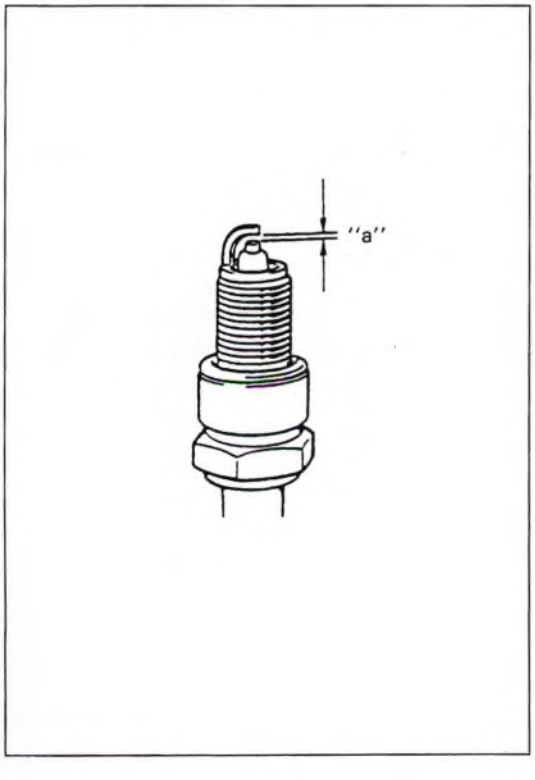
6) Measure resistance of high-tension cord by using ohmmeter.

High-tenesion cord resistance: 10—22 kΩ/m

7) If resistance exceeds specification, inspect distributor terminal and replace high-tension cord(s) and/or distributor cap as required.

CAUTION:
- **Never attempt to use metal conductor high-tension cords as replacing parts.**
- **Insert each cap portion fully when installing high-tension cords.**

SPARK PLUGS



1) Remove breather pipe bolts (3pcs.) and camshaft housing cover.
2) Pull out high-tension cords by gripping their caps and then remove spark plugs.
3) Replace them with specified new plugs.

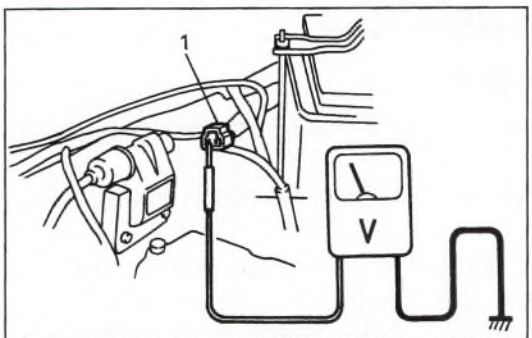
Spark plug air gap "a": 0.8—0.9 mm

Spark plug type: NGK DCP7EVX
: NIPPONDENSO XU22EP-ZU

4) Install spark plugs and torque them to specification.

Tightening Torque for spark plug
10—20 N·m (1.0—2.0 kg-m)

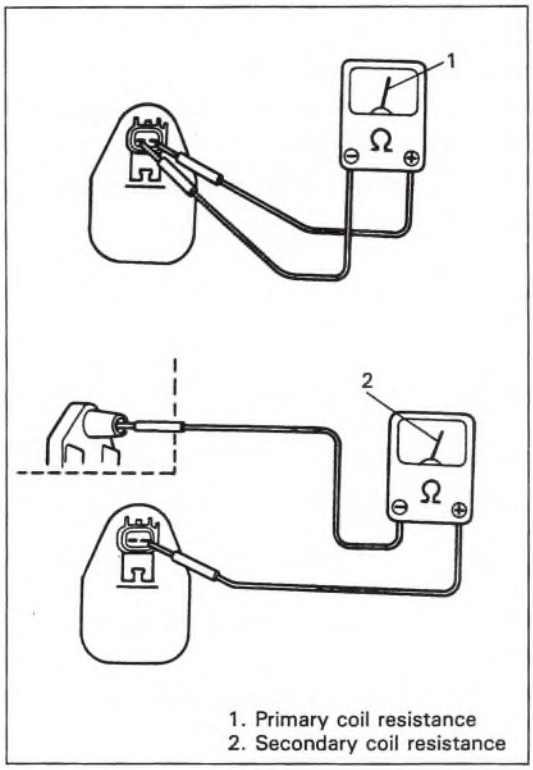
5) Install high-tension cords securely by gripping their caps.
6) Install camshaft housing cover and breather pipe bolts.



1. Engine harness coupler IG+ (B/W) terminal

IGNITION COIL

1) Disconnect ignition coil coupler, turn on igition switch and check to make sure that engine harness coupler terminal IG+ have battery voltage.
2) If no voltage or low voltage is found, check fuse, wiring harness and coupler.

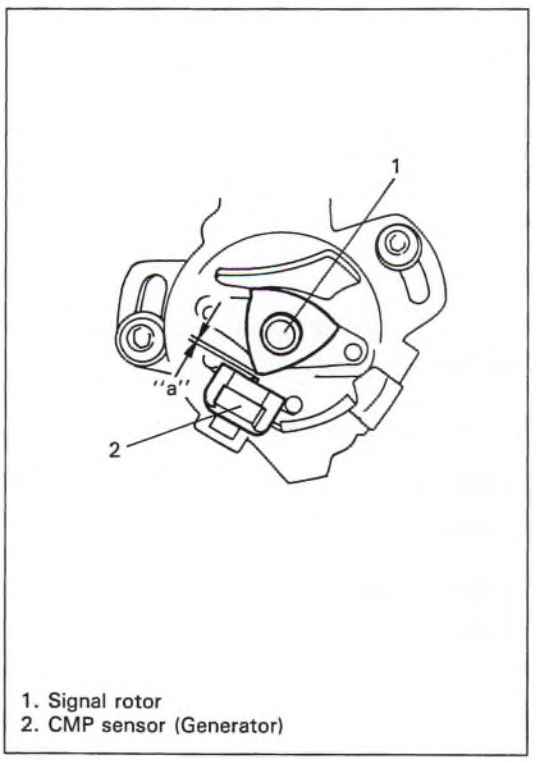


1. Primary coil resistance
2. Secondary coil resistance

3) Measure primary and secondary coil resistances.

Ignition coil resistance (at 20°C) for open magnetic type
Primary : 1.35—1.65 Ω
Secondary: 23.4—28.6 kΩ

4) If resistance is out of specification, replace coil with new one.



1. Signal rotor
2. CMP sensor (Generator)

DISTRIBUTOR

Signal Rotor Air Gap

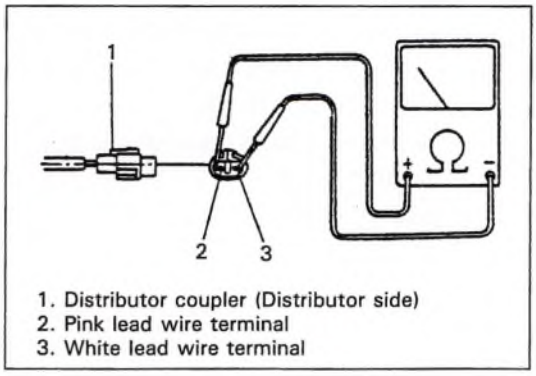
1) Remove distributor cap, rotor ass'y and cover.
2) Using thickness gauge, measure air gap, between signal rotor tooth and CMP sensor (generator).

Signal rotor air gap "a": 0.2—0.4 mm

3) If gap is out of specification, loose CMP sensor (signal generator) securing screws. Using blade (—) screw driver, move CMP sensor (generator) and adjust gap to specification. After adjustment, tighten securing screws and recheck gap.

NOTE:
Check to make sure that CMP sensor (signal generator) tooth is free from any metal particles.

4) Install distributor cap and rotor.

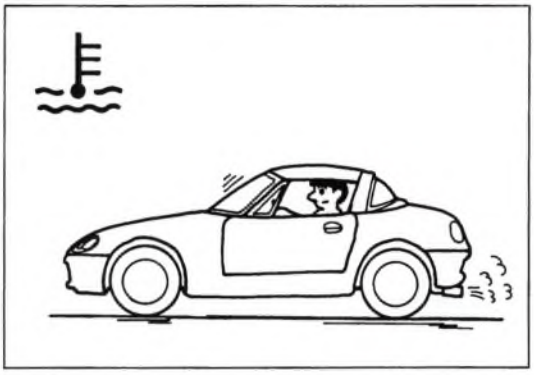


1. Distributor coupler (Distributor side)
2. Pink lead wire terminal
3. White lead wire terminal

CMP Sensor (Pickup Coil) Resistance

1) Disconnect distributor lead coupler.
2) Measure resistance of pickup coil by using ohmmeter.
3) If resistance is out of specification, replace CMP sensor (signal generator).

Pickcup coil resistance: 210—260 Ω (at 20°C)

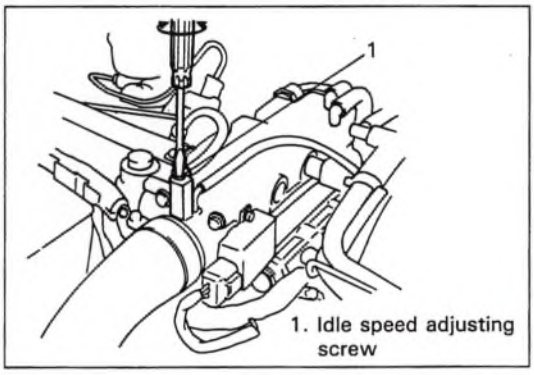


IGNITION TIMING

NOTE:
Before starting engine, place transmission gear shift lever in "Neutral" and set parking brake.

INSPECTION AND ADJUSTMENT

1) Start engine and warm it up to normal operating temperature.

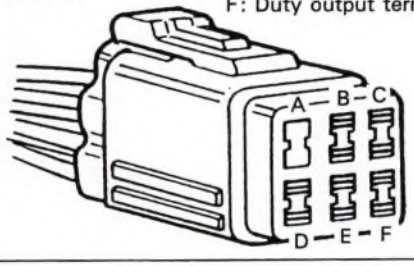


1. Idle speed adjusting screw

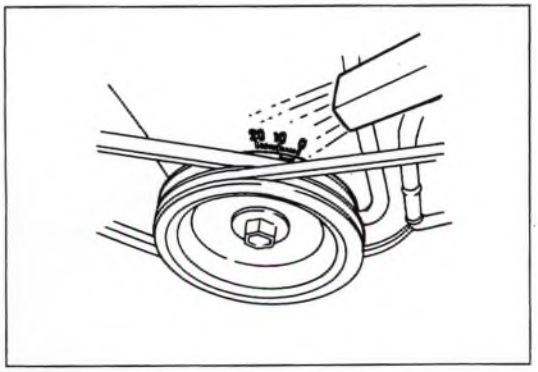
2) Make sure that all of electrical loads except ignition are switched off.
3) Check to be sure that idle speed is within specification.

Idle speed: 950 ± 50 rpm (r/min)

1. Monitor coupler
A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

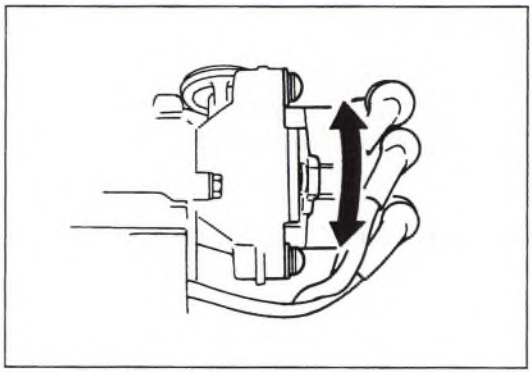


4) Set timing light to No.1 high-tension cord.
5) Remove monitor coupler cap.
6) Connect D and E terminals of monitor coupler or E to body by using service wire so that ignition timing is fixed on initial one.



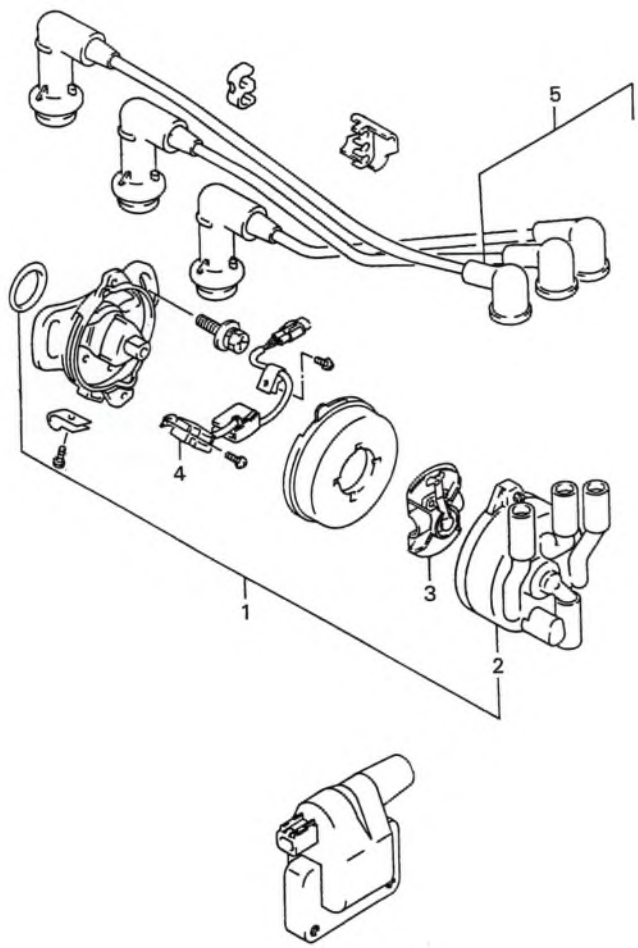
7) Using timing light, check that timing is within specification.

Initial ignition timing (Test switch terminal grounded):
5 ± 1° BTDC (at idle speed)



8) If ignition timing is out of specification, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts.
9) After tightening distributor flange bolts, recheck that ignition timing is within specification.
10) After checking and/or adjusting Initial Ignition Timing, disconnect service wire from monitor coupler.

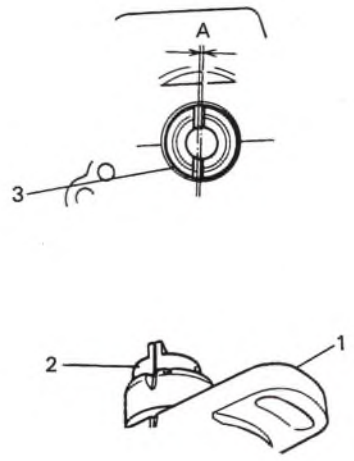
DISTRIBUTOR UNIT



1. Distributor assembly
2. Distributor cap
3. Rotor assembly
4. Pick-up coil (CMP sensor)
5. High-tension cord

DISMOUNTING

1) Disconnect distributor lead coupler.
2) Remove distributor cap screws and cap.
3) Remove distributor flange bolts.
4) Pull out distributor housing assembly.



1. Distributor
2. Distributor coupling
3. Camshaft

A: Slot offset

REMOUNTING

NOTE:

- **Before installing distributor, check to make sure that its O ring is in good condition.**
- **If new O ring is installed, apply oil.**

1) Install distributor without cap to camshaft.
 Fit the dogs of distributor coupling into the slots of camshaft, when installing. The dogs of distributor coupling are offset. Therefore, if the dogs can not be fitted into the slots, turn the distributor shaft by 180 degree and try again.
2) Lightly install flange bolts and prepare for ignition timing adjustment.
3) Check to make sure that rotor is in good condition.
4) Inspect distributor cap and clean or replace as required.
5) Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
6) Connect distributor lead coupler.
7) Check and adjust ignition timing as previously outlined.

SPECIAL TOOLS

			
09900-25002 Pocket tester	09900-27301 Timing light (DC 12V)	09930-76420 Timing light (Dry cell type)	

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SECTION 6G

CRANKING SYSTEM

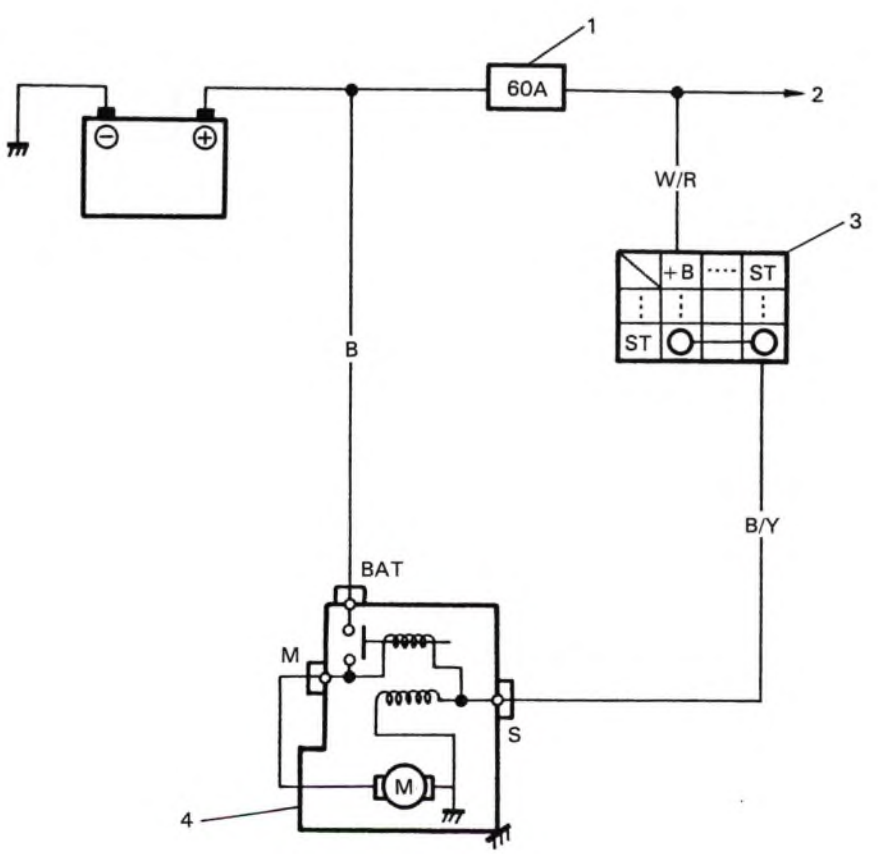
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GENERAL DESCRIPTION

CRANKING CIRCUIT

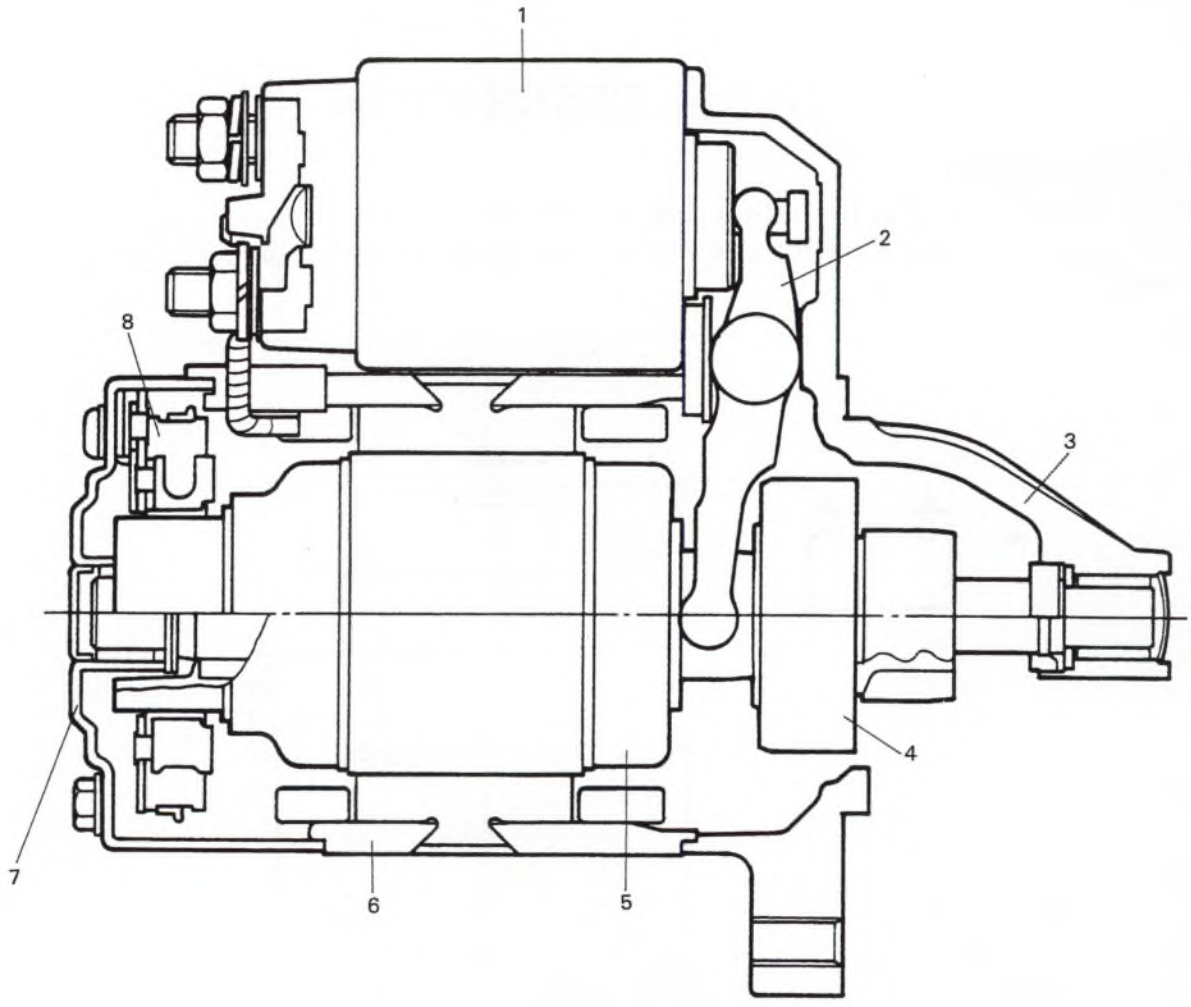
The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically as shown in figure below. Only the starting motor will be covered in this section.



1. Main fuse
2. To generator
3. Ignition switch
4. Starting motor

STARTING MOTOR

The starting motor consists of parts shown in figure below and has permanent magnets mounted in starting motor yoke (frame).
The magnetic switch assembly and parts in the starting motor are enclosed in the housings so that they will be protected against possible dirt and water splash.
In the circuit shown in figure on previous page, the magnetic (motor) switch coils are magnetized when the ignition switch is closed. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place. When the engine starts, the pinion over-running clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.



1. Magnetix switch assembly
2. Drive lever
3. Front bracket
4. Over running clutch
5. Armature
6. Yoke assembly
7. Rear bracket
8. Brush

DIAGNOSIS

Possible symptoms due to starting system trouble would be as follows.

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine exactly where the cause of each trouble lies in battery, wiring harness, (including starting motor switch), starting motor or engine.

Do not remove motor just because starting motor does not run. Check following items and narrow down scope of possible causes.

- Condition of trouble
- Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals
- Discharge of battery

Condition	Possible Cause	Correction
Motor not running	**No operating sound of magnetic switch**	
	• Battery run down	Recharge battery.
	• Battery voltage too low due to battery deterioration	Replace battery.
	• Poor contact in battery terminal connection	Retighten or replace.
	• Loose grounding cable connection	Retighten.
	• Fuse set loose or blown off	Tighten or replace.
	• Poor contacting action of ignition switch	Replace.
	• Lead wire coupler loose in place	Retighten.
	• Open-circuit between ignition switch and magnetic switch	Repair.
	• Open-circuit in pull-in coil	Replace magnetic switch.
	• Poor sliding of plunger	Replace.
Motor not running	**Operating sound of magnetic switch heard**	
	• Battery run down	Recharge battery.
	• Battery voltage too low due to battery deterioration	Replace battery.
	• Loose battery cable connections	Retighten.
	• Burnt main contact point, or poor contacting action of magnetic switch	Replace magnetic switch.
	• Brushes are seating poorly or worn down	Repair or replace.
	• Weakened brush spring	Replace.
	• Burnt commutator	Replace.
	• Layer short-circuit of armature	Replace.
	• Crankshaft rotation obstructed	Repair.

64B40-6G2-4-1

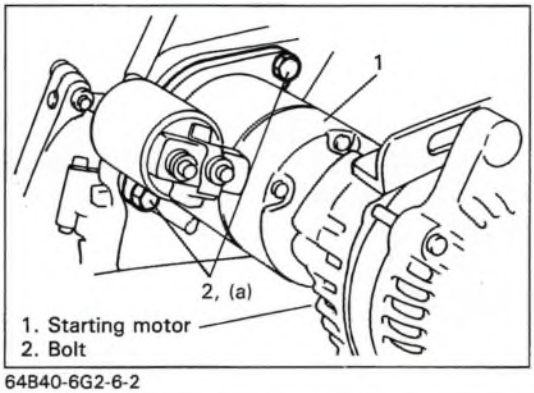
Condition	Possible Cause	Correction
Starting motor running but too slow (small torque)	**If battery and wiring are satisfactory, inspect starting motor**	
	• Insufficient contact of magnetic switch main contacts	Replace.
	• Layer short-circuit of armature	Replace.
	• Disconnected, burnt or worn commutator	Repair or replace.
	• Worn brushes	Replace.
	• Weakened brush springs	Replace spring
	• Burnt or abnormally worn end bushings	Replace.
Starting motor running, but not cranking engine	• Worn pinion tip	Replace overrunning clutch.
	• Poor sliding of overrunning clutch	Replace.
	• Overrunning clutch slipping	Replace.
	• Worn teeth of ring gear	Replace flywheel.
Noise	• Abnormally worn bush	Replace.
	• Worn pinion or worn teeth of ring gear	Replace pinion or flywheel.
	• Poor sliding of pinion (failure in return movement)	Repair or replace.
Starting motor does not stop running	• Fused contact points of magnetic switch	Replace.
	• Short-circuit between turns of magnetic switch coil (layer short-circuit)	Replace.
	• Failure of returning action in ignition switch	Replace.

64B40-6G2-5-1

UNIT REPAIR OVERHAUL

For overhauling of starting motor, it is recommended that component parts should be cleaned thoroughly. However, yoke assembly, armature coil, overrunning clutch assembly, magnetic switch assembly, rubber or plastic parts and center bearing & shock absorber assembly of reduction type motor are NOT ALLOWED to be washed in degreasing tank or with grease dissolving solvent. Those parts should be cleaned by blowing air and wiping with cloth.

64B40-6G2-6-1



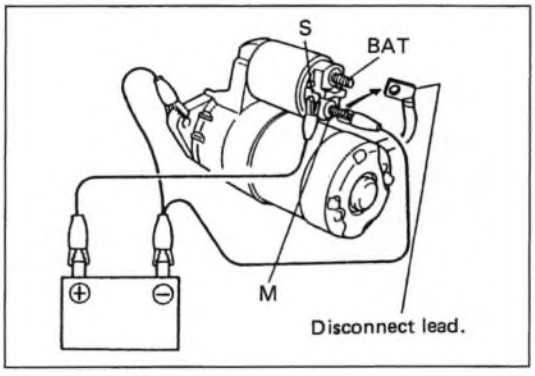
1. Starting motor
2. Bolt

DISMOUNTING AND REMOUNTING

1. Disconnect negative (—) battery lead at battery.
2. Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
3. Remove 2 mounting bolts.
4. Remove starting motor.
5. To remount, reverse above procedure.

Tightening Torque
(a): 18—28 N·m (1.8—2.8 kg-m)

64B40-6G2-6-2



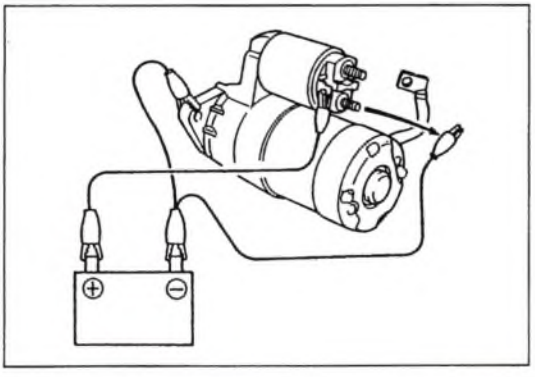
PERFORMANCE TEST

CAUTION:
Each test must be performed within 3—5 seconds to avoid coil from burning.

PULL-IN TEST

Connect test leads as shown and check that pinion (overrunning clutch) jumps out. If it does not, replace magnetic switch.

NOTE:
Before testing, disconnect field coil lead from terminal M.

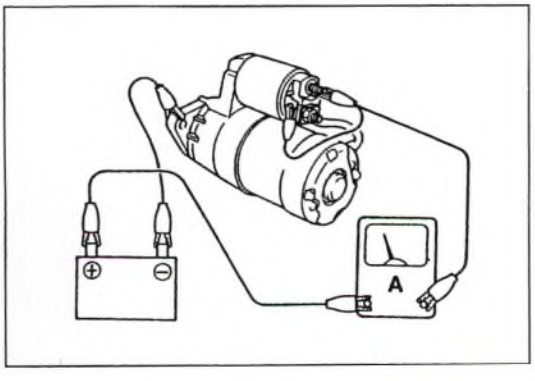


HOLD-IN TEST

While connected as the above with pinion out, disconnect negative lead from terminal M and check that pinion remains out. If not, replace magnetic switch.

PINION (PLUNGER) RETURN TEST

As a next step to the above, disconnect negative lead and check to make sure that pinion returns inward quickly.

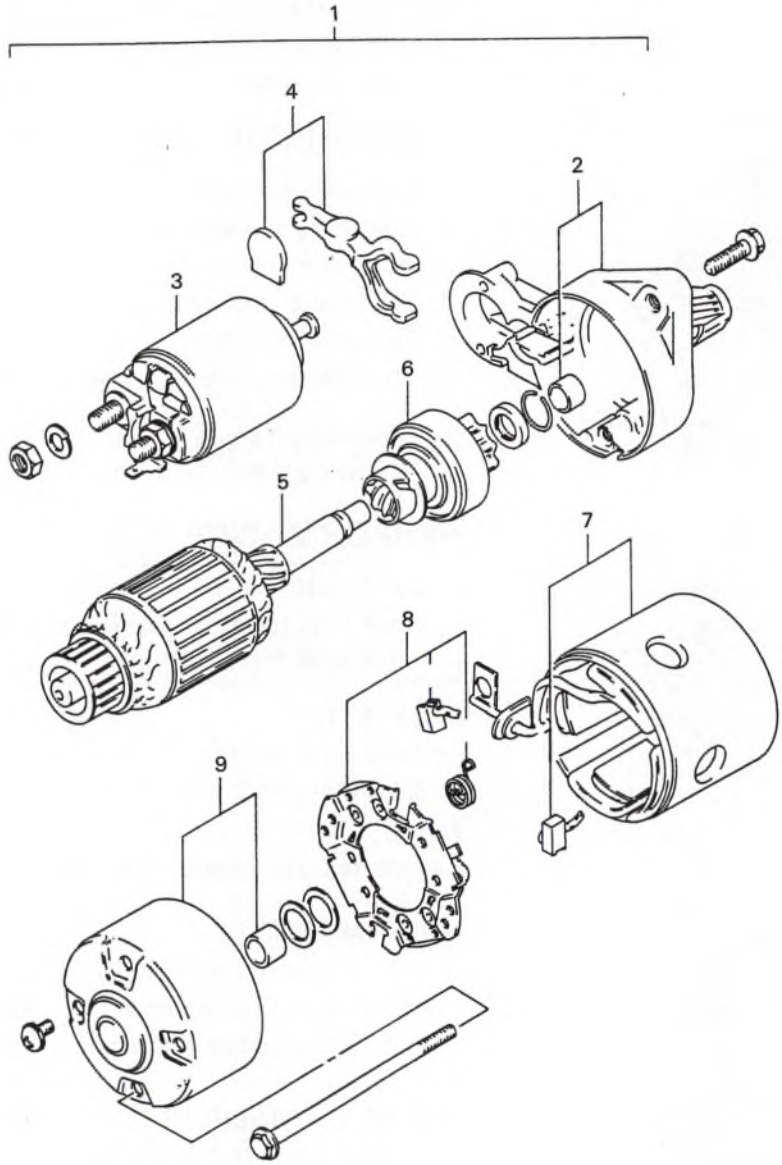


NO-LOAD PERFORMANCE TEST

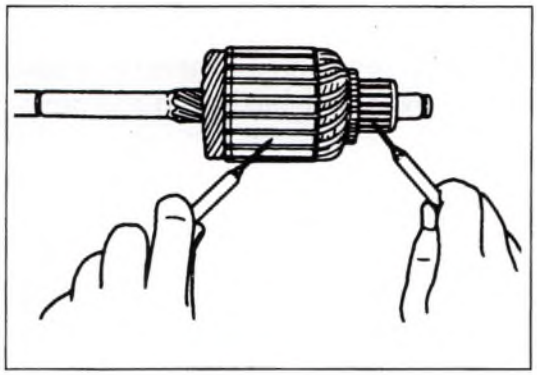
Connect test leads as follows and check that motor runs without fail with pinion moved out.
Also check that ammeter indicates specified current.

No load current: Within 53A at 11V

STARTING MOTOR ASSEMBLY



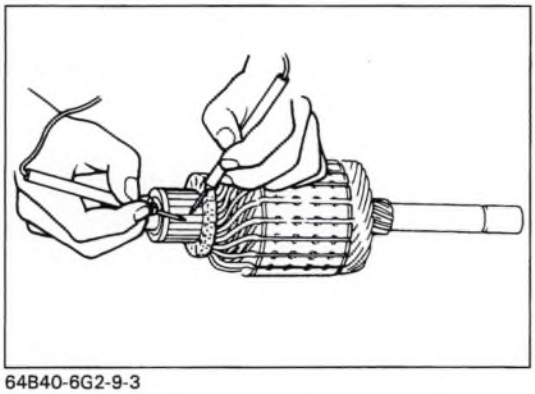
1. Starting motor assembly
2. Front bracket
3. Magnet switch
4. Pinion drive lever
5. Armature
6. Over running clutch
7. Yoke assembly
8. Brush holder assembly
9. Housing assembly



INSPECT ARMATURE

Ground

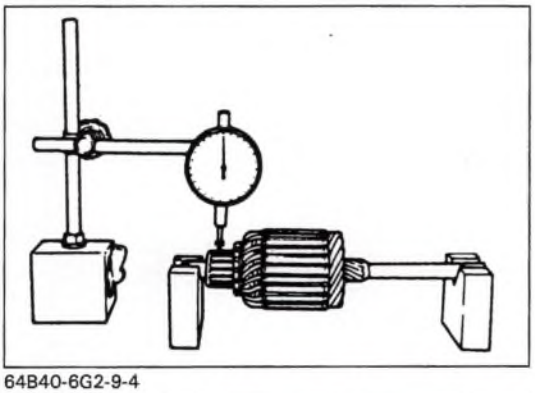
Between commutator segment and armature core should be insulated. Use ohmmeter for inspection.



64B40-6G2-9-3

Open Circuit

Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.

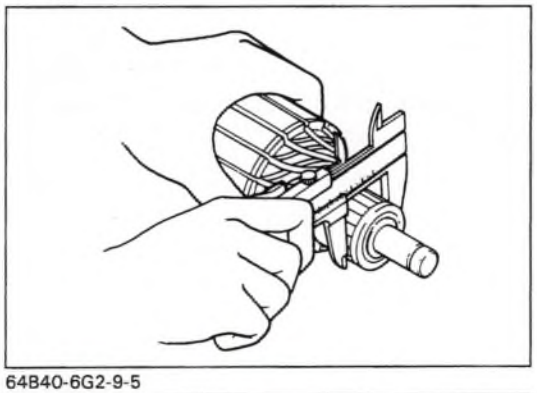


64B40-6G2-9-4

Commutator Run-out

Check commutator for run-out with armature supported on V blocks. Correct it by using lathe, if required.

Commutator run-out
Service limit (maximum value): 0.4 mm

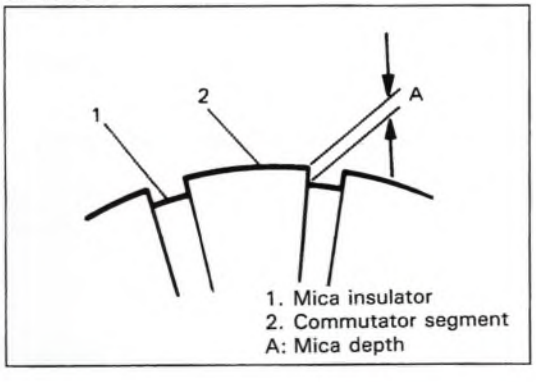


64B40-6G2-9-5

Commutator Diameter

Check for wear and replace armature if diameter is below limit.

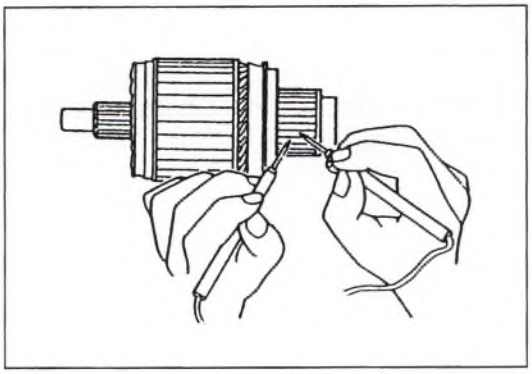
Commutator diameter
Service limit (minimum value): 27 mm



Commutator Surface

Correct and clean surface by using #400 emery cloth. Also check mica depth and correct it as required.

Commutator mica depth A
Service limit (minimum value): 0.2 mm



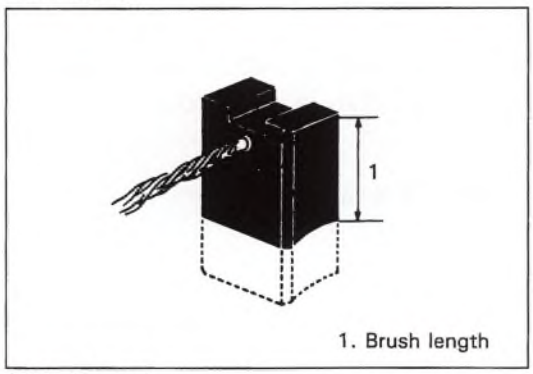
OPEN CIRCUIT TEST

Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.

INSPECT YOKE

Check field coil for continuity. There should be continuity between brush and yoke body.

64B40-6G2-10-2



1. Brush length

64B40-6G2-10-3

INSPECT BRUSH

Measure length of brushes and replace them as necessary.

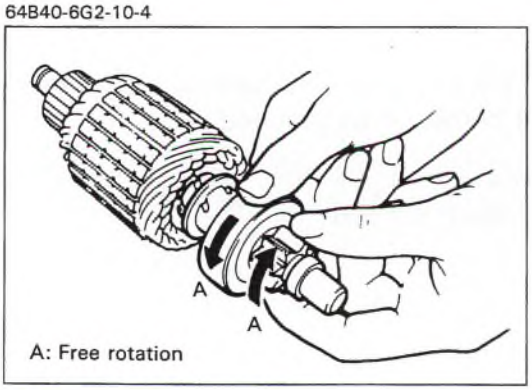
Brush length

Service limit (minimum value): 11.5 mm

INSPECT BRUSH HOLDER

Check brush springs for rust or breakage. Also check brush holder for rust and positive plates for insulation. Replace it as assembly, if required.

64B40-6G2-10-4



A: Free rotation

INSPECT OVERRUNNING CLUTCH

Inspect one way clutch for free rotation in A direction and locked up in the other way round.

Also check pinion for abnormal wear and replace it as assembly, if required.

SECTION 6H

CHARGING SYSTEM

CONTENTS

GENERAL DESCRIPTION 6H- 2
DIAGNOSIS 6H- 4
ON-VEHICLE SERVICE 6H- 4
Battery 6H- 4
Generator Belt Tension 6H- 7
Generator 6H- 8
UNIT REPAIR OVERHAUL 6H-10
Inspection and Correction 6H-11
SPECIFICATIONS 6H-12

GENERAL DESCRIPTION

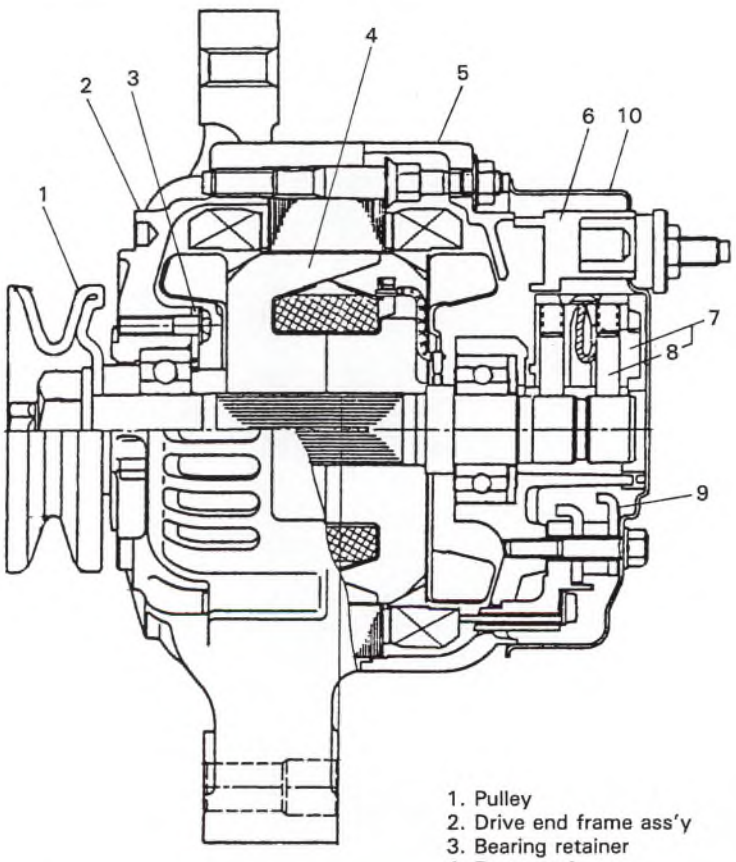
The basic charging system is the IC intregal regulator charging system. The internal components are connected electrically as shown on page 6H-8.

The generator features a solid state regulator that is mounted inside the generator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the slip ring and frame. The generator voltage setting cannot be adjusted.

The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.

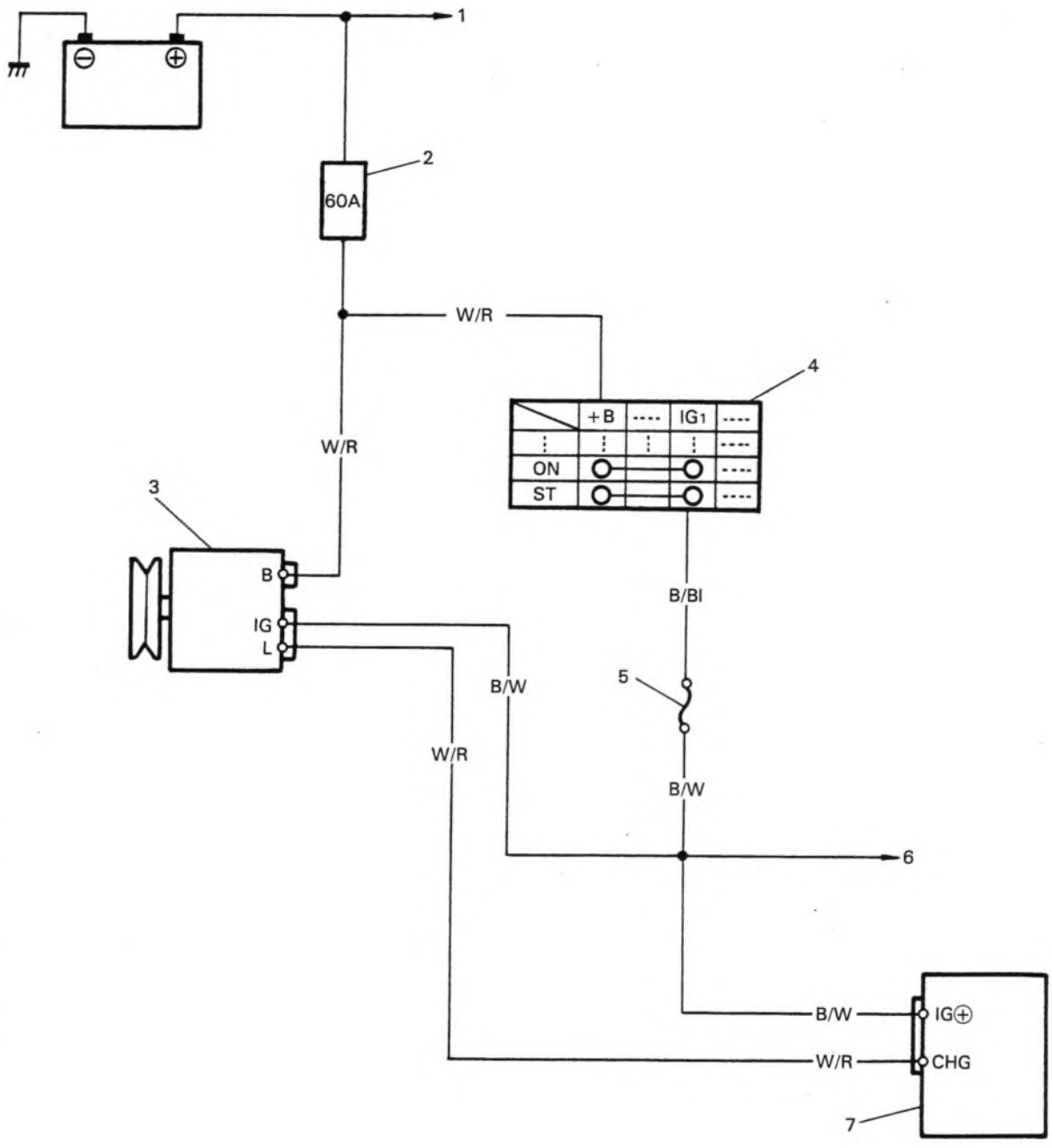
The stator windings are assembled on the inside of a laminated core that forms part of the generator frame. A rectifier bridge connected to the stator windings contains six diodes, and electrically changes the stator A.C. voltages to a D.C. voltage which appears at the generator output terminal. The neutral diodes serve to convert the voltage fluctuation at the neutral point to direct current for increasing the generator output.

A condenser mounted in the regulator assembly protects the diodes from high voltages and suppresses radio noise.



1. Pulley
2. Drive end frame ass'y
3. Bearing retainer
4. Rotor ass'y
5. Rear end bracket
6. Regulator ass'y
7. Brush holder ass'y
8. Brush
9. Rectifier holder
10. Rear end cover

WIRING CIRCUIT



1. Starting motor
2. Main fuse
3. Generator
4. Ignition switch
5. Fuse (IG. COIL METER)
6. To ignition coil
7. Combination meter

DIAGNOSIS

Trouble	Possible cause	Correction
Charge indicator light does not light with ignition ON and engine off	• Fuse blown • Light burned out • Wiring connection loose • IC regulator or field coil faulty	Check fuse Replace light Tighten loose connection Repair or replace
Charge indicator light does not go out with engine running (battery requires frequent recharging)	• Drive belt loose or worn • IC regulator or alternator faulty • Wiring faulty	Adjust or replace belt Check charging system Repair wiring

ON-VEHICLE SERVICE

BATTERY

CARE OF BATTERY

The following information is basic in nature and is nothing new; it is merely a reiteration of what every Service shop personnel knows about the automotive storage battery. The information is intened to serve as a reminder to the reader, with a hope that he will, in turn, remind each final user of the important basic facts about the battery whenever opportunity permits him to engage in a conversation with the final user in the shop or out of the shop.

1) The battery is a very reliable component, but needs periodical attentions.
 Keep the battery container clean; prevent rust formation on the terminal posts; keep the electrolyte up to the upper level uniformly in all cells; and try to keep the battery fully charged at all times.
2) Preserve the capacity of the battery.
 There is a limit to the ability of the battery to hold electricity is store. This limit is called ''capacity.''

There are several ways for the battery to lower its capacity:

a. Loss of electrolyte, or fall in electrolyte level.
 When this happens, the battery cannot hold so much electricity as it originally could. Handle the battery with care when you take it down. Barring the loss of electrolyte by careless spilling or otherwise, the electrolyte level goes down gradually in the battery at work because the water content of it evaporates. Periodically refill distilled water to each cell, as necessary, so that the electrolyte is always up to the specified level. Never allow its surface to fall so much as to expose the cell plates.
b. Ovecharging the battery in place or off the machine.
 In recharging the battery off the machine, caution must be exercised so as not to overcharge it. Overcharging gives rise to several complexities. For one thing, it heats up the battery to deform the battery container to result in a destroyed battery. Overcharging could occur in a battery in place if the voltage regulator is maladjusted to allow the alternator (or the dynamo in other machines) to develop too high an output voltage. For another thing, ''gassing'' occurs in a battery being overcharged to result in a loss of water content. One of the most serious consequences of overcharging is the swelling of positive-plate grids, causing the grids to crumble and the plates to buckle.
c. Undercharging the battery in place.
 Regulator malfunctioning is usually the cause of the battery remaining in a state of charge far below its capacity. This condition is very undesirable in freezing weather, for the electrolyte in such a battey can easily freeze up to result in a destroyed battery. Moreover, an undercharged battery is an easy prey to a greater evil-sulfation.

d. Sulfation

Let us recall the electrochemical reactions that take place in the battery during charging and discharging. As the battery gives out its energy (discharging), the active materials in its cell plates are converted into lead sulfate.

During recharging, this lead sulfate is reconverted into active material. If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. "Sulfation" means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but it is a damaged battery and its capacity is lower than before.

3) Keep the battery cable connections clean.

The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current. The inability of the starter motor to crank the engine is often due to the rust formation in the battery cable connection. Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

4) Be always in the know as to the state of charge of the battery.

The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an inexpensive instrument for measuring the specific gravity (S.G.) of the battery electrolyte. Why measure the S.G.? Because the S.G. of the electrolyte is indicative of the state of charge.

The direct method of checking the battery for state of charge is to carry out a high rate discharge test, which involves a special precise voltmeter, an expensive instrument used generally in the service shops but no recommendable to the user of the machine.

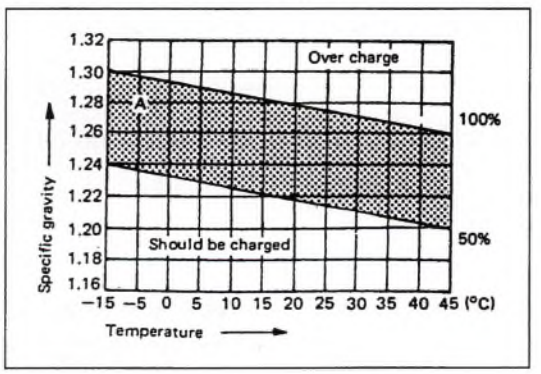
At 20°C of battery temperature (electrolyte temperature):

The battery is in FULLY CHARGED STATE in the electrolyte S.G. is 1.280.

The battery is in HALF CHARGED STATE in the S.G. is 1.220.

The battery is in NEARLY DISCHARGED STATE if the S.G. is 1.150 and is in danger of freezing.

What if the battery temepratures not 20°C? Since the S.G. varies with temeprature, you have to correct your S.G. reading (taken with your hydrometer) to the value at 20°C, and apply the corrected S.G. value to the three-point guide stated above. This manner of correction needs a chart showing the relation between S.G. and temperature. There is a simpler way: refer to the graph given below, which tells you the state of charge for a range of S.G. value and a range of temperature.



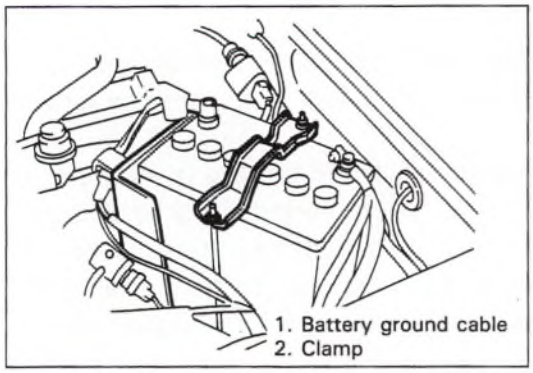
How to use the temperature-corrected state-of-charge graph. Suppose your S.G. reading is 1.28 and the battery temperature is −5°C. Locate the intersection of the −5°C line and the 1.28 S.G. line. The intersection is "A". It is in the zone for CHARGED STATE. How much is the battery charged? To find out the answer, draw a line parallel to the zone demarcation line, extending it to the right, and see where this line crosses the percentage scale. In the present example, the line crosses at, say, 85% point. The battery is 85% fully charged.

REMOVE AND REPLACE

When handling a battery, the following safety precautions should be followed:

1) Hydrogen gas is produced by the battery. A flame or spark near the battery may cause the gas to ignite.
2) Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately.

To remove or replace a battery, always disconnect the negative cable first, then the positive cable.



BATTERY CABLES

Connect battery cables as shown in light figure and make sure to properly tighten all terminals.

JUMP STARTING IN CASE OF EMERGENCY WITH AUXILIARY (BOOSTER) BATTERY

NOTE:
Both booster and discharged battery should be handled carefully when using jumper cables. Follow procedure outlined below, being careful not to cause sparks.

CAUTION:
- **Do not attempt to start vehicle by pushing or towing it. Damage to emission system and/or to other parts of vehicle may result.**
- **Departure from these conditions or procedure below could result in damage to electronic components of either vehicle.**
- **Remove rings, watches, and other jewelry.**

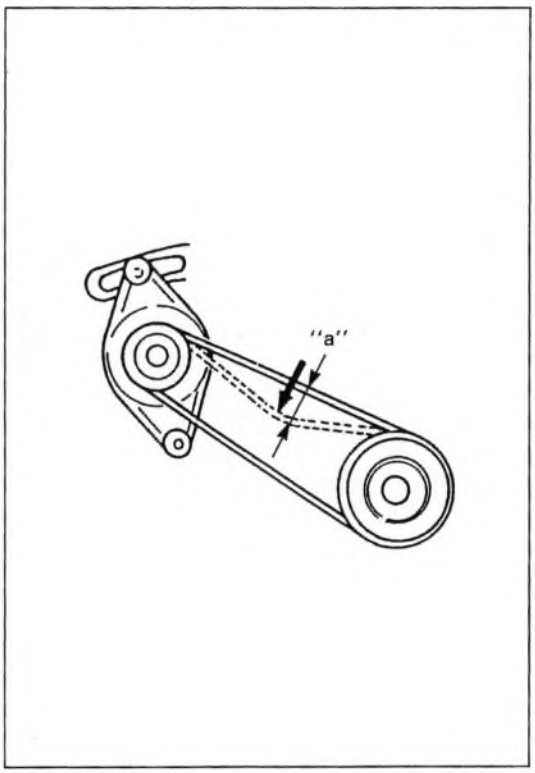
WARNING:
- **Never expose battery to open flame, or electric spark-batteries generate gas which is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surfaces as fluid is a corrosive acid.**
 Flush any contacted area with water immediately and thoroughly. Be careful so that metal tools or jumper cables do not contact positive battery terminal (or metal in conntact with it) and any other metal on vehicle, because a short circuit could occur. Batteries should always be kept out of reach of children.
- **Wear approved eye protection.**
- **Departure from these conditions or procedure above could result in serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid, or electrical burns.**

1) Apply parking brake and place transmission in ''NEUTRAL''. Turn off ignition, turn off lights and all other electrical loads.
2) Check electrolyte level. If it is below low level line, replace battey.

NOTE:
When jump starting engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.

3) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. Do not permit vehicles to touch each other as this could cause ground connection and counteract benefits of this procedure.
(Use 12-volt battery only to jump start engine).

4) Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as A/C compressor bracket or generator mounting bracket). Make sure that the ground is at least 18 inches away from battey of vehicle being started (DO NOT CONNECT DIRECTLY TO NEGATIVE TERMINAL OF DISCHARGED BATTERY).
5) Start engine of vehicle that is providing jump start and turn off electrical accessories. Then start engine of the vehicle with discharged battery.
6) Reverse these directions exactly when removing jumper cable. Negative cable must be disconnected from engine that was jump started first.



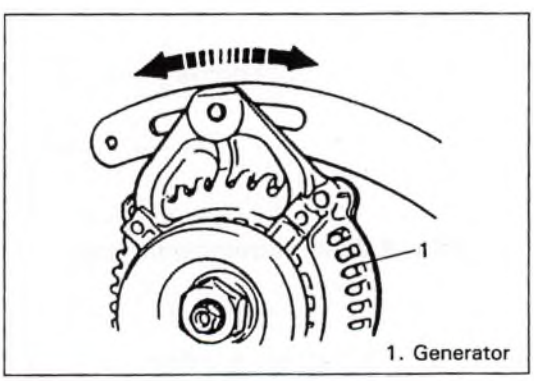
GENERATOR BELT TENSION

WARNING:
Disconnect negative cable at battery before checking and adjusting belt tension.

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If necessary, replace belt.
2) Check belt for tension. Belt is in proper tension when it deflects 9 to 11 mm under thumb pressure (about 10 kg).

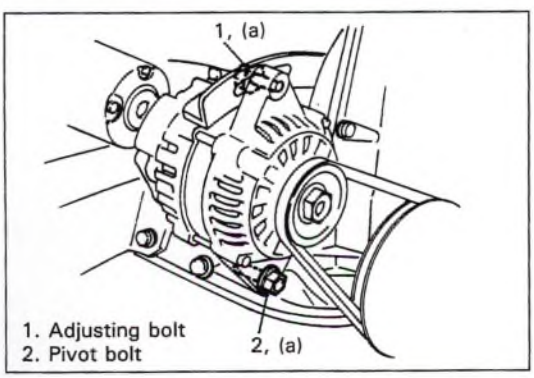
Belt Tension Specification
"a": 9—11 mm as deflection/10 kg

NOTE:
When replacing belt with a new one, adjust belt tension to 7—11 mm.



1. Generator

3) If belt is too tight or too loose, adjust it to proper tension by displacing generator position.



1. Adjusting bolt
2. Pivot bolt

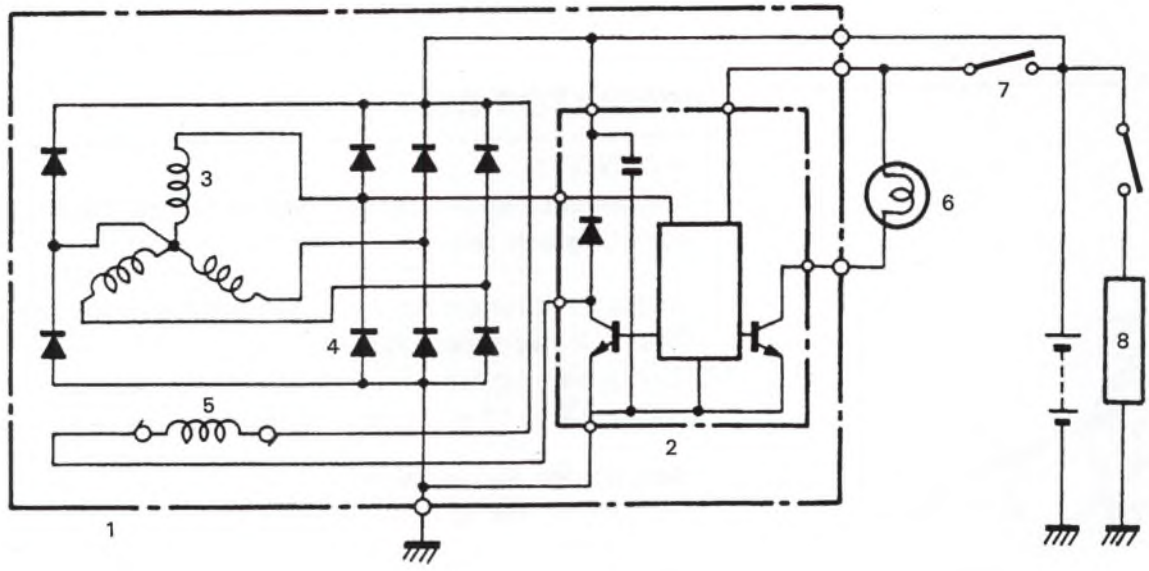
4) Tighten alternator adjusting bolt and pivot bolts.

Tightening Torque
(a): 18—28 N·m (1.8—2.8 kg-m)

5) Connect negative cable at battery terminal.

GENERATOR

The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown below.



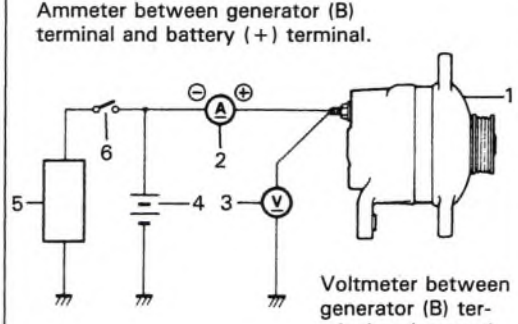
1. Regulator
2. I.C. regulator
3. Stator coil
4. Diode
5. Field coil (Rotor coil)
6. Charge light
7. Main switch
8. Load

INSPECTION

A charging circuit wiring diagram for generator connection is shown above. To avoid damage, always follow these precautions:

CAUTION:

- **Do not mistake polarities of IG terminal and L terminal.**
- **Do not create a short circuit between IG and L terminals. Always connect these terminals through lamp.**
- **Do not connect any load between L and E.**
- **When connecting a charger or a booster battery to vehicle battery, see Battery section.**



1. Generator
2. Ammeter
3. Voltmeter
4. Battery
5. Load
6. Switch

UNDERCHARGED BATTERY

To check generator when battery is undercharged, use following procedure.

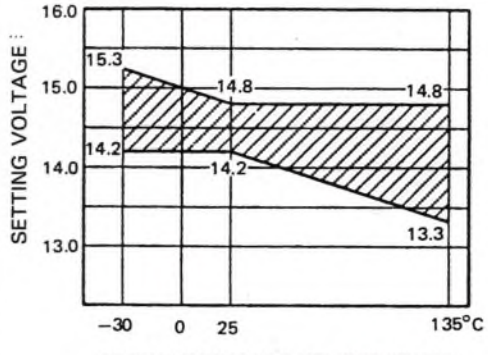
1) Connect voltmeter and ammeter as shown in left figure.

NOTE:
Use fully charged battery.

2) Run engine from idling up to 2,000 rpm and read meters.

Standard current: 10 A maximum
Standard voltage: 14.4—15.0 V (at 20°C)

NOTE:
Turn off switches of all accessories (wiper, heater etc.)



NOTE:
Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in left figure.

3) If voltage is higher that standard value, check ground of brush.
 If brush ground is correct, replace IC regulator.
4) If voltage is in standard value, run engine at 2,000 rpm and turn on head light and heater motor.
 Mesure current and if less than no-electric loaded test value, repair generator.

OVERCHARGED BATTERY

To check generator when battery is overcharged, use following procedure.

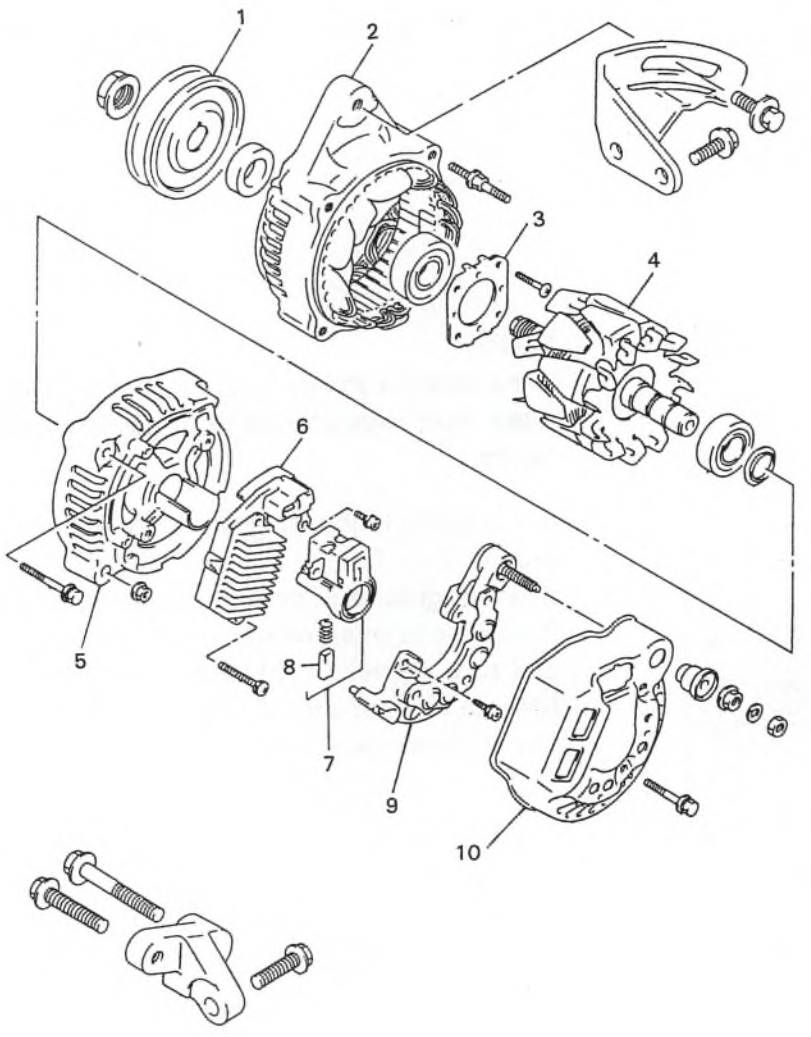
1) With engine running at 2,000 rpm, measure voltage.
2) If measured voltage is out out of standard value, check brush ground or IC regulator.

UNIT REPAIR OVERHAUL

REMOVAL

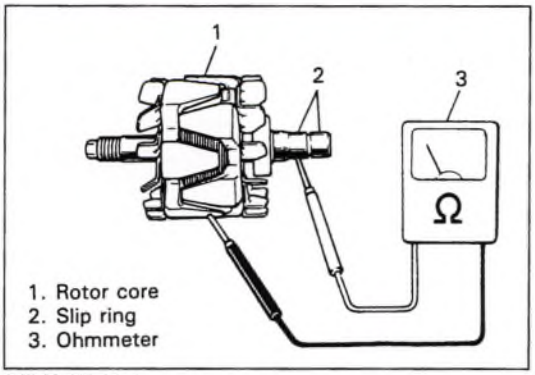
1) Disconnect negative cable at battery.
2) Disconnect generator lead wire and coupler.
3) Remove generator drive belt adjusting bolt and generator mounting bolts.
4) Remove generator.

DISASSEMBLY/REASSEMBLY



1. Pulley
2. Drive end frame ass'y
3. Bearing retainer
4. Rotor ass'y
5. Rear end bracket
6. Regulator ass'y
7. Brush holder ass'y
8. Brush
9. Rectifier holder
10. Rear end cover

Disassemble/Reassemble generator by referring to figure.



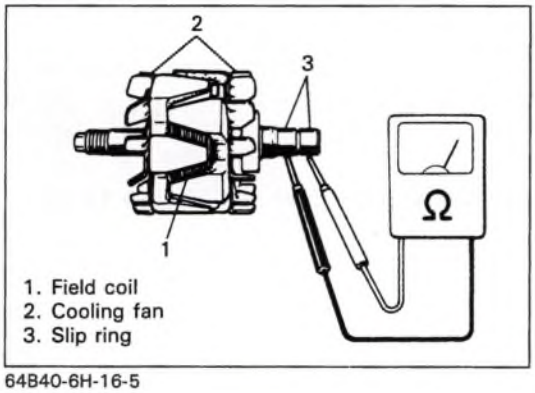
64B40-6H-16-4

INSPECTION AND CORRECTION

ROTOR

Ground

Between slip rings and rotor core should be insulated. Use ohmmeter for inspection.



64B40-6H-16-5

Open circuit

Check continuity and resistance of field coil by applying ohmmeter probes to slip rings. If resistance is out of specification, replace rotor.

Field coil resistance: 2.8 — 3.0 Ω

FAN

Make sure that fan blades are all in good condition.

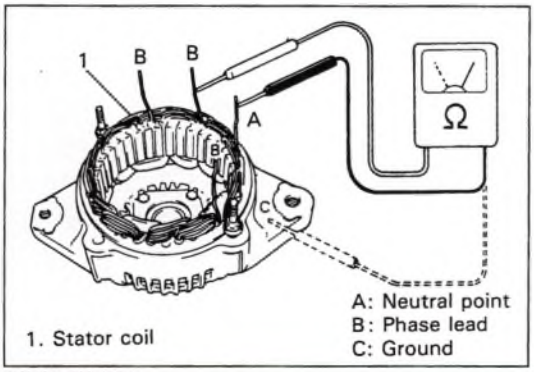
BEARING

Check for smooth rotation by hand.

DRIVE END BEARING

Before remove it, check for smooth rotation by hand.

64B40-6H-17-1



64B40-6H-17-2

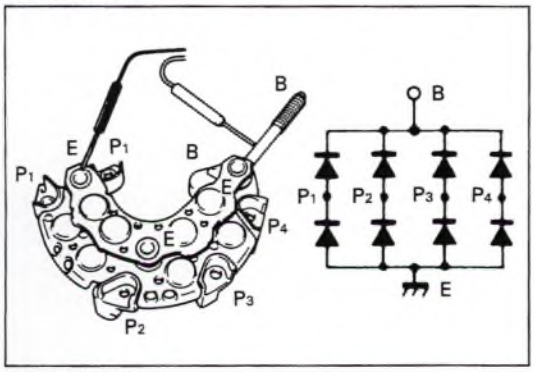
STATOR

Ground

Using ohmmeter, check to make sure that stator coil is insulated from core.

Open circuit

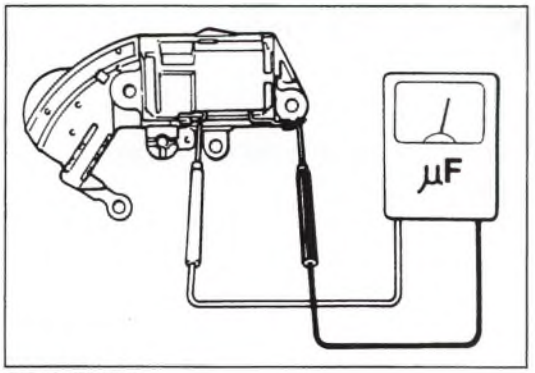
Check continuity between neutral point A and each phase B.



RECTIFIER

Using kΩ range ohmmeter, check continuity between B terminal and ground. Put a tester probe to terminal B and the other probe to ground, then swap two probes. Only one direction should have continuity and the other should be infinity. If not, replace rectifier assembly.

CAUTION:
Do not use 500V megger for testing rectifier. It will cause to damage diodes in rectifier.

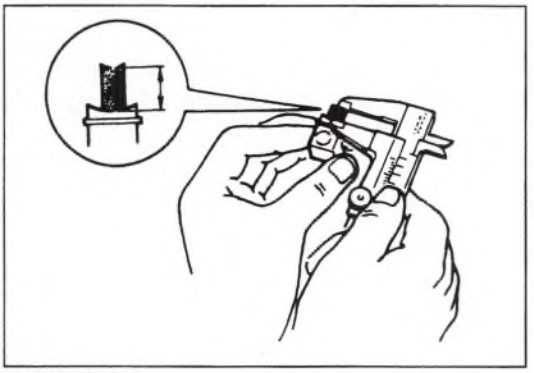


64B40-6H-17-4

CONDENSER

Use condenser tester to check condition of condenser.

Condenser capacity: 0.5 μF



64B40-6H-17-5

BRUSH

Check each brush for wear by measuring its length as shown. If brush is found worn down to service limit, replace brush with holder.

Brush length service limit (minimum value): 4.5 mm (0.18 in)

SPECIFICATIONS

Rated voltage	12V	Permissible ambient temperature	−30 to 90°C
Maximum output	50A (Hot at 13.5V)	Polarity	Negative ground
Permissible max. speed	15,000 r/min.	Rotation	Clockwise viewed from pulley side
No-load speed	1,110 r/min.		
Setting voltage	14.2 to 14.8V (5,000 r/min. 10A 25°C)		

64B40-6H-18-1

SECTION 6J

EMISSION CONTROLS

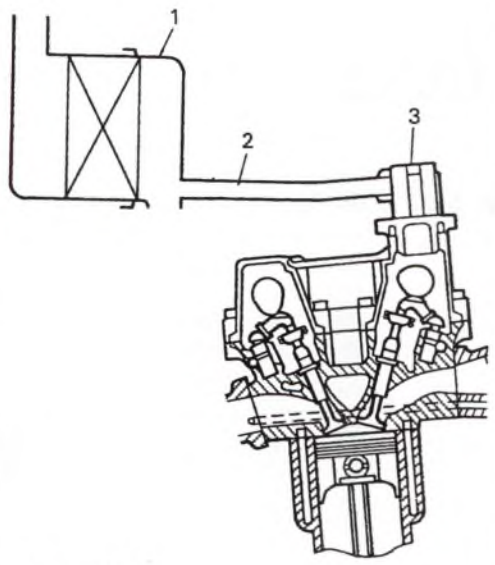
NOTE:
For the descriptions (items) not found in this SECTION, refer to SECTION 6E.

CONTENTS

GENERAL DESCRIPTION 6J-2
Positive Crankcase Ventilation (PCV) System 6J-2
Evaporative Emission (EVAP) Control System 6J-2
Three Way Catalytic Converter 6J-3
Exhaust Temperature Warning Light System 6J-3
ON-VEHICLE SERVICE 6J-4
PCV Hose 6J-4
EVAP Canister 6J-4
Tank Pressure Control (TPC) Valve 6J-4
Exhaust Temperature Warning Light System 6J-5

GENERAL DESCRIPTION

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

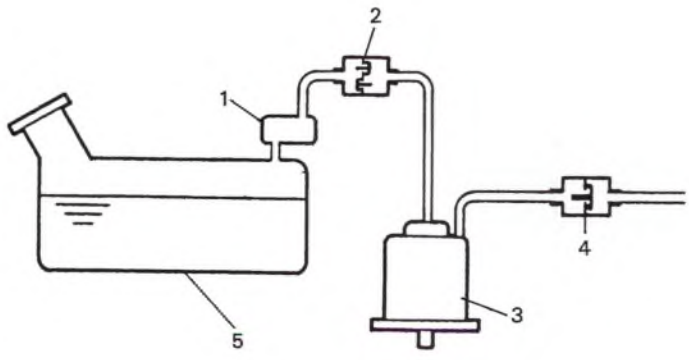


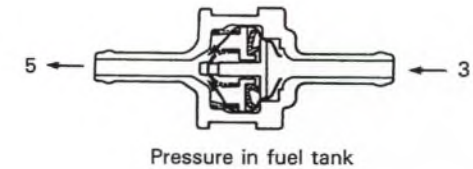
1. Air cleaner
2. PCV hose
3. Bleather case

The term ''blow-by gas'' stands for the compressed gas and exploded gas which blow through cylinder-to-piston clearance, which contain a large amount of unburned gases such as CO and HC. The PCV (Positive Crankcase Ventilation) system is provided to prevent the blow-by gas from being emitted into atmosphere,

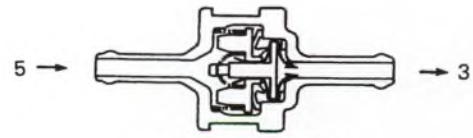
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

An evaporative emission control system is used to prervent emission of fuel vapor.
The vapor generated in the fuel tank while driving or the engine at a stop passes through a tank pressure control valve and enters the EVAP (charcoal) canister where the charcoal absorbs and stores the fuel vapor. When the engine runs, the fuel vapor stored in the canister is drawn into the intake manifold together with fresh air.
The tank pressure control valve is provided to keep the pressure in the fuel tank constant. When the pressure in the fuel tank becomes positive and reaches its specified value, it opens the valve to let the vapor flow into the EVAP canister. On the other hand, when the pressure in the fuel tank becomes negative and reaches its specified value, it opens the valve to let the air flow into the fuel tank.



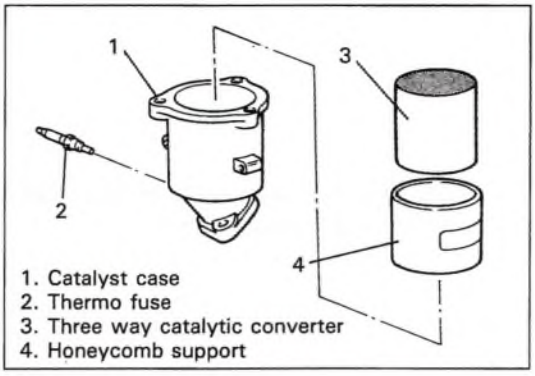


Pressure in fuel tank become regative



Pressure in fuel tank become positive

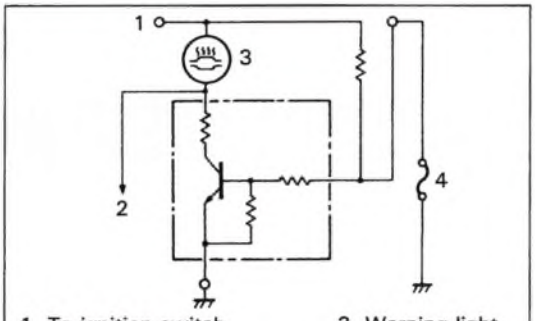
1. Fuel/vapor separator
2. Tank pressure control valve
3. EVAP canister
4. 1-way check valve
5. Fuel tank



1. Catalyst case
2. Thermo fuse
3. Three way catalytic converter
4. Honeycomb support

THREE WAY CATALYTIC CONVERTER

The three way catalytic converters are provided in the exhaust system (catalyst case and exhaust center pipe No.1). The function of the catalyst is to reduce the emission of CO, HC and NOx in the exhaust gas by oxidizing or converting them into CO_2, H_2O and N_2 respectively.



1. To ignition switch
2. To generator L-terminal
3. Warning light
4. Thermo fuse

EXHAUST TEMPERATURE WARNING LIGHT SYSTEM

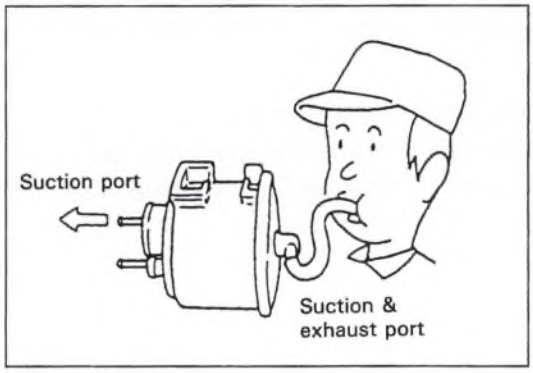
This system is so designed that when catalytic oxidation device is heated to high temperature due to abnormal engine combustion (such as overrich and misfire), thermo fuse will melt to cause warning light to light.

ON-VEHICLE SERVICE

PCV HOSE

INSPECTION

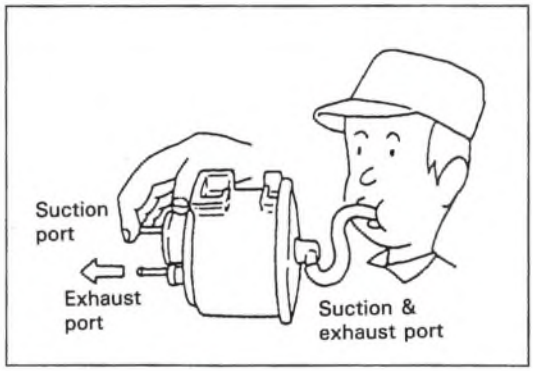
Inspect PCV hose for damage, deterioration, connection (leakage) and blockage. If found faulty, replace hose.



EVAP CANISTER

INSPECTION

1) Blow hard into suction & exhaust port located at bottom of canister and check that air comes out of suction port.



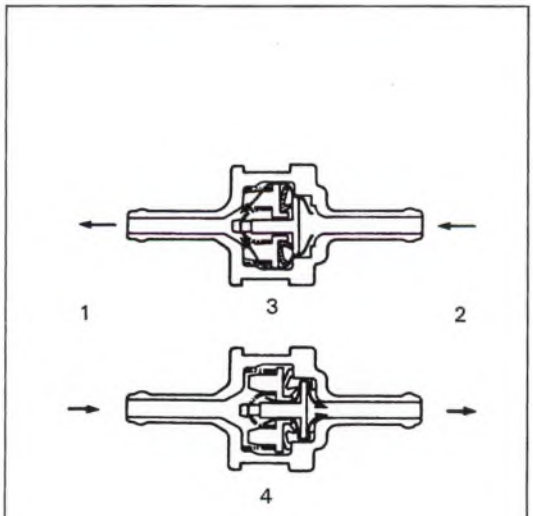
2) With suction port of canister closed with finger, blow hard into suction & exhaust port at its bottom and check that valve of exhaust port opens and air comes out of it.

TANK PRESSURE CONTROL (TPC) VALVE

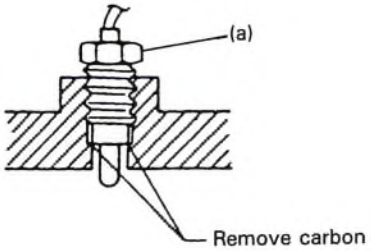
INSPECTION

WARNING:
DO NOT SUCK air through tank pressure control valve. Fuel vapor inside the valve is harmful.

1) Blow hard from fuel tank side (black side of check valve), and air should pass through valve smoothly and come out from its orange side.
2) Blow only softly from orange side, and air should come out from black side.
3) If air doesn't pass through valve in step 1) or hard blow is required in step 2), replace tank pressure control valve.



1. Fuel tank side (Black side)
2. EVAP canister side (Orange side)
3. Pressure in fuel tank negative
4. Pressure in fuel tank positive



EXHAUST TEMPERATURE WARNING LIGHT SYSTEM

INSPECTION

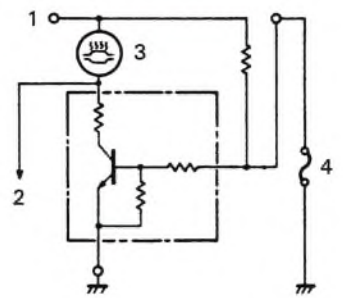
Thermo Fuse

When installing thermo fuse for replacement or for any other reason, remove carbon from threaded hole in catalyst case, install thermo fuse and tighten it to specified torque.

Tightening Torque

(a): 30—40 N·m (3.0—4.0 kg-m)

System Circuit



1. To ignition switch
2. To generator L-terminal
3. Warning light
4. Thermo fuse

	While engine cranking	After engine start	Cndition
Warning light	Lights	Does not light	Normal
	Does not light	Does not light	• Light bulb burnt out • Wiring faulty
	Lights	Lights	• Exhaust temperature is too high • Fuse blown • Transistor faulty

NOTE:

Cause for flashing of EX lamp during running is poor connection at fuse terminal or faulty installation of fuse.

SECTION 6K

EXHAUST SYSTEM

CONTENTS

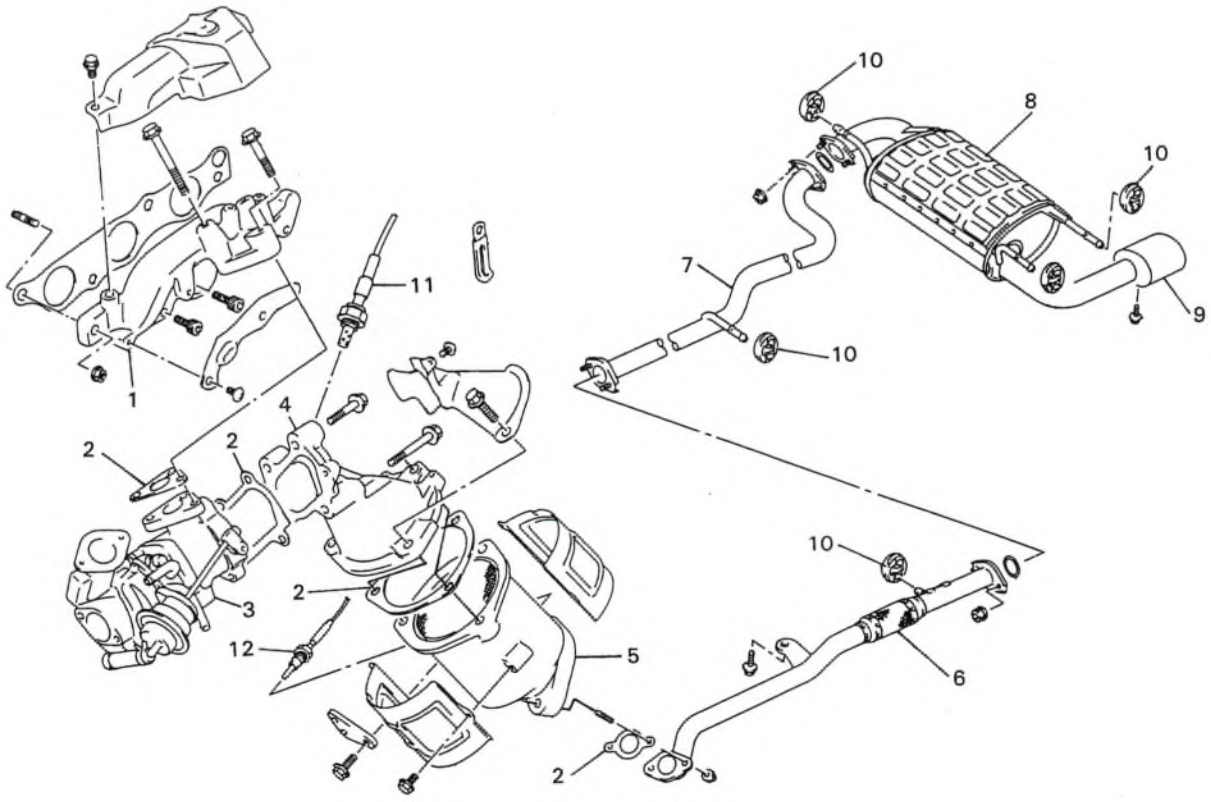
GENERAL DESCRIPTION 6K-1
MAINTENANCE 6K-2
ON-VEHICLE SERVICE 6K-2

GENERAL DESCRIPTION

The exhaust system consists of an exhaust manifold, a turbocharger, a catalyst case, two exhaust center pipes, a muffler, a tail pipe, seals and gaskets etc., and the catalyst case has the three way catalytic converter.

The three way catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) pollutants in the exhaust gas.

THE CATALYTIC CONVERTER REQUIRES USE OF UNLEADED FUEL ONLY.



1. Exhaust manifold
2. Gasket
3. Turbocharger
4. Turbo outlet pipe
5. Catalyst case
6. Exhaust center pipe No.1
7. Exhaust center pipe No.2
8. Muffler
9. Tail pipe
10. Mounting
11. Oxygen sensor
12. Thermo catalyst fuse

MAINTENANCE

WARNING:
To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connection, dent and damage.
 If bolts or nuts are loosened, tighten them to specified torque. Refer to "ON-VEHICLE SERVICE" for torque data.
- Check nearby body areas for damaged, missing, or mispositioned part, open seam, hole, loose connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

ON-VEHICLE SERVICE

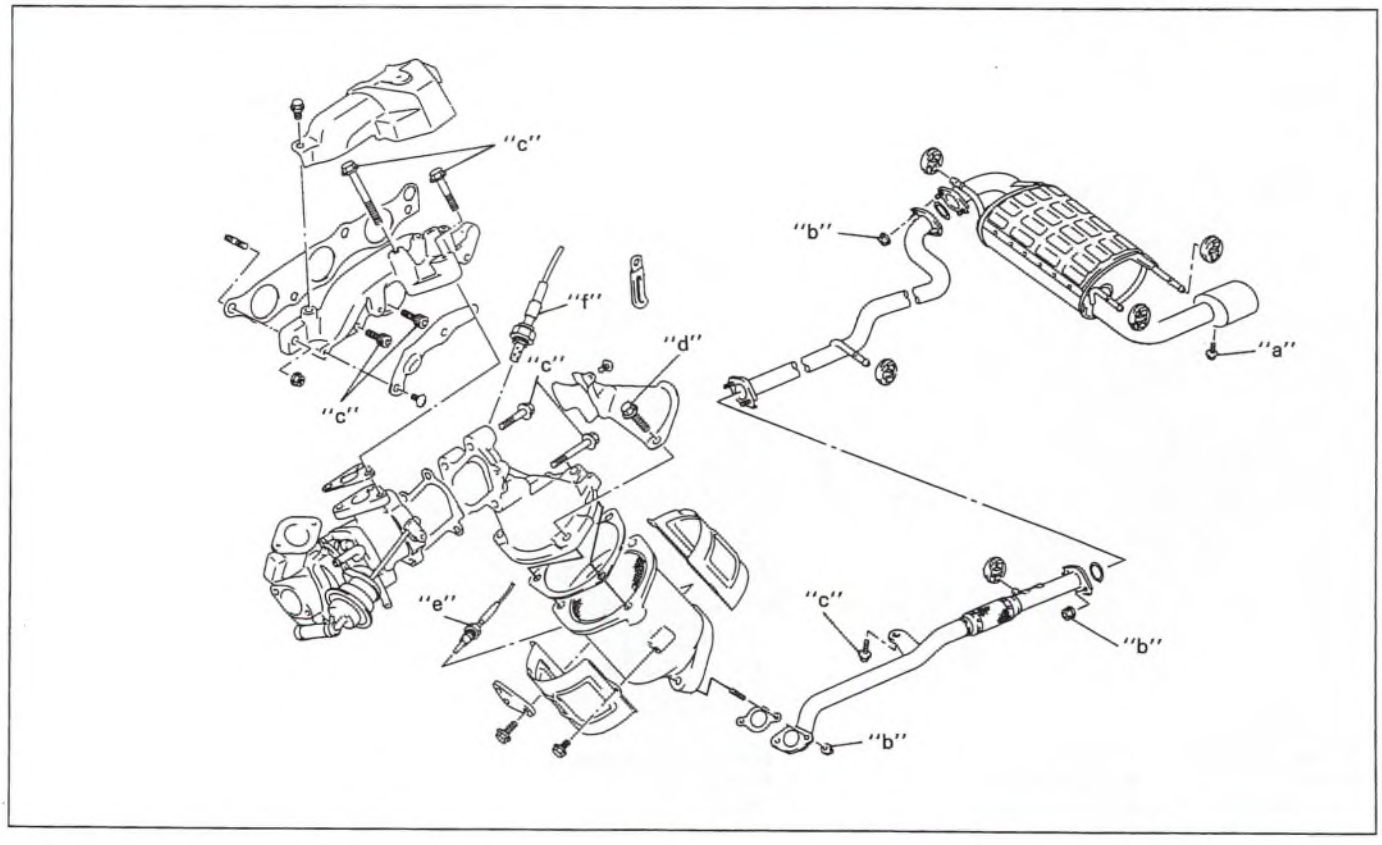
- Refer to Section 6A/6L for removal and installation procedures of exhaust manifold/turbocharger.
- For replacement of center pipe, muffler, tail pipe or any part used to mount or connect them, be sure to hoist car and obseve WARNING given at the left or this page.

CAUTION:
As catalyst case and exhaust center pipe No.2 have three way catalytic converters in them, they should not be exposed to any impulse. Be careful not to drop them or hit them against something.

- When exhaust manifold is removed, check gaskets and seal for deterioration or damage. Replace them as necessary.
- Tighten bolts and nuts to specified torque when reassembling.

Tightenint Torque

"a": 8—12 N·m (0.8—1.2 kg-m)
"b": 40—60 N·m (4.0—6.0 kg-m)
"c": 18—28 N·m (1.8—2.8 kg-m)
"d": 40—50 N·m (4.0—5.0 kg-m)
"e": 30—40 N·m (3.0—4.0 kg-m)
"f" : 45—55 N·m (4.5—5.5 kg-m)



SECTION 6L

TURBOCHARGER

CONTENTS

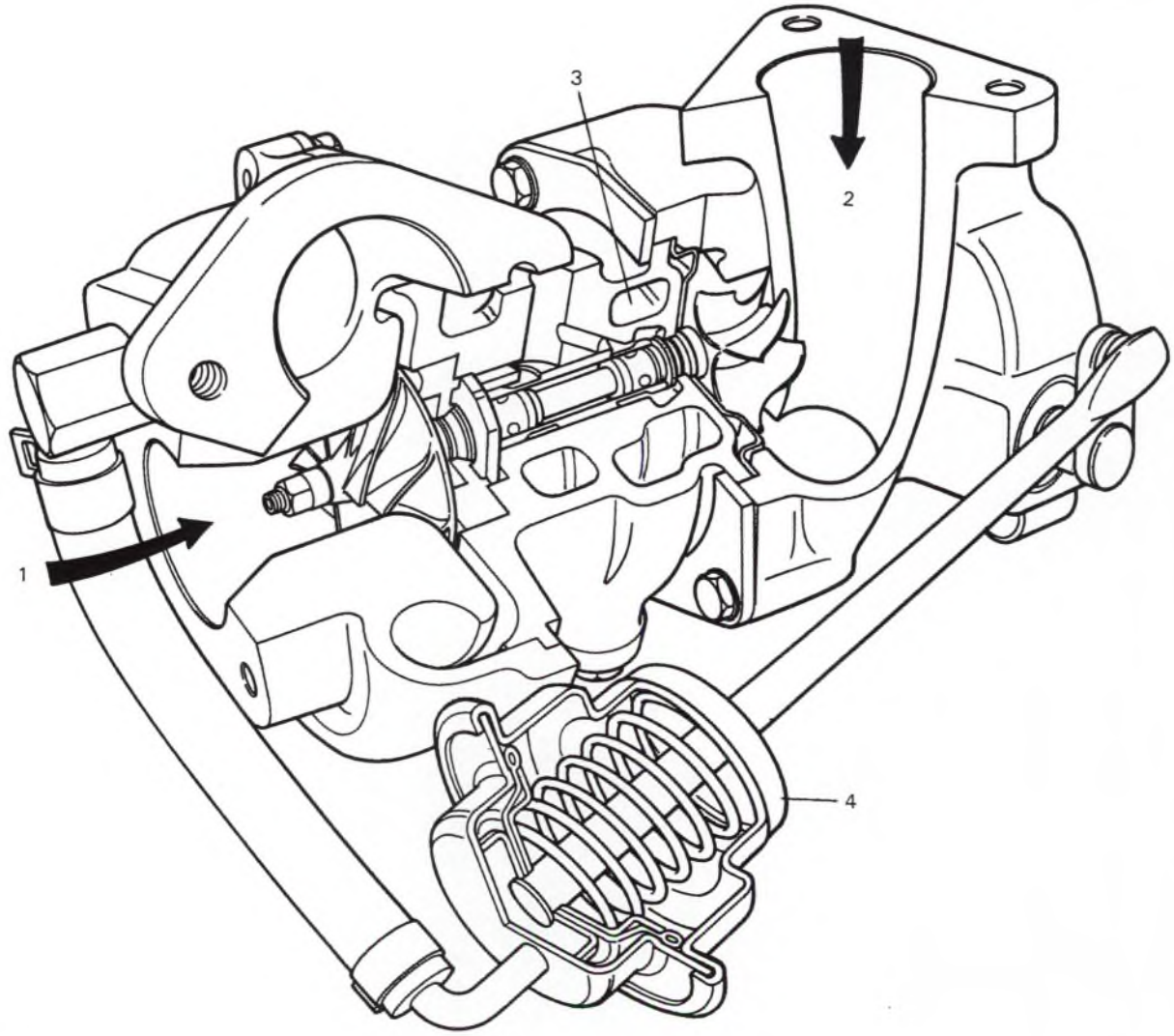
GENERAL DESCRIPTION 6L-2
Operation 6L-3
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Intercooler 6L-4
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Inspection 6L-5
Removal 6L-6
Installation 6L-7
SPECIAL TOOL 6L-8

GENERAL DESCRIPTION

The turbocharger is a mechanism to increase engine horse power. To describe its operation shortly, the high temperature and high pressure energy of the exhaust gas is made use of to run the exhaust turbine. As the compressor is on the same shaft as the turbine, the compressor is driven to compress the air drawn in. Consequently, more air enters the combustion chamber and the power strokes become stronger.

The turbocharger installed on the exhaust manifold consists of:

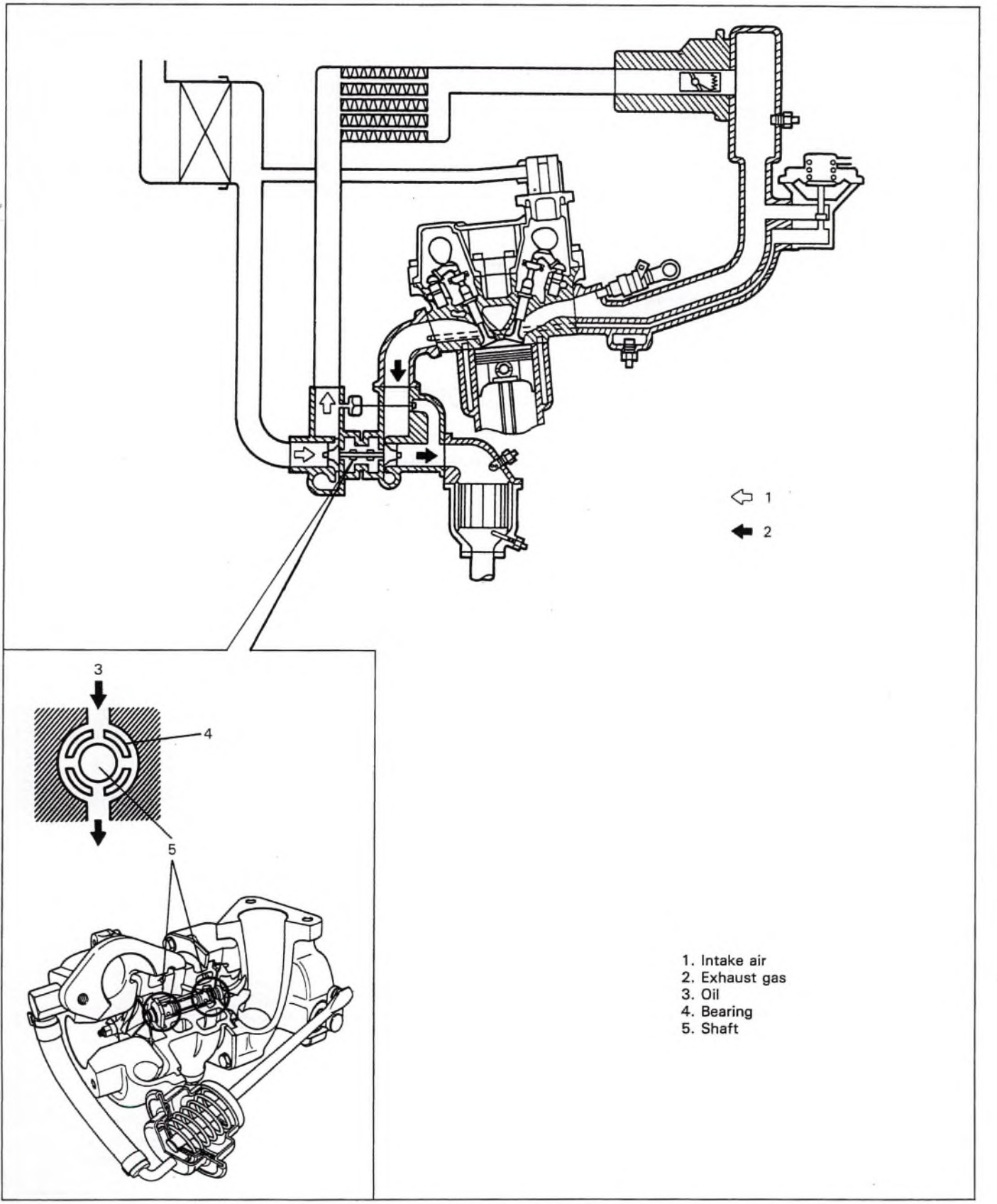
- turbine wheel which utilizes energy in the exhaust gases to drive the compressor,
- compressor wheel which compresses the intake air and supercharges it to the intercooler,
- center bearing and center housing which retains the shaft linking the compressor wheel and turbine wheel,
- compressor housing and turbine housing which guide the intake air and exhaust gases, and
- waste gate valve which controls the supercharged pressure.



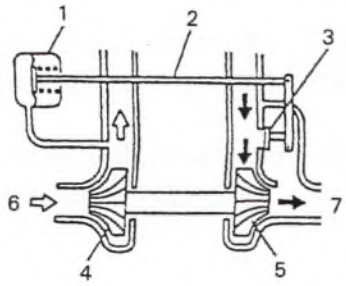
1. Air
2. Exhaust gas
3. Water jacket
4. Wast gate valve

OPERATION

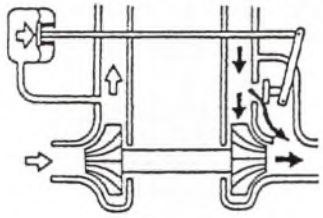
The shaft rotates at a speed of a high as about a hundred thousand r/min. Therefore a full floating type bearing is used for the center bearing which retains this shaft. With the full floating bearing, the bearing can rotate freely between the shaft and housing.
As the oil is filled between shaft and bearing as well as bearing and housing, the shaft vibration is absorbed. Also, as the bearing itself rotates, the relative slip velocity with the shaft is reduced.



1. Intake air
2. Exhaust gas
3. Oil
4. Bearing
5. Shaft



Under waste gate valve opening pressure



Above waste gate valve opening pressure

1. Waste gate valve actuator
2. Rod
3. Waste gate valve
4. Compressor wheel
5. Turbine wheel
6. Air
7. Exhaust gas

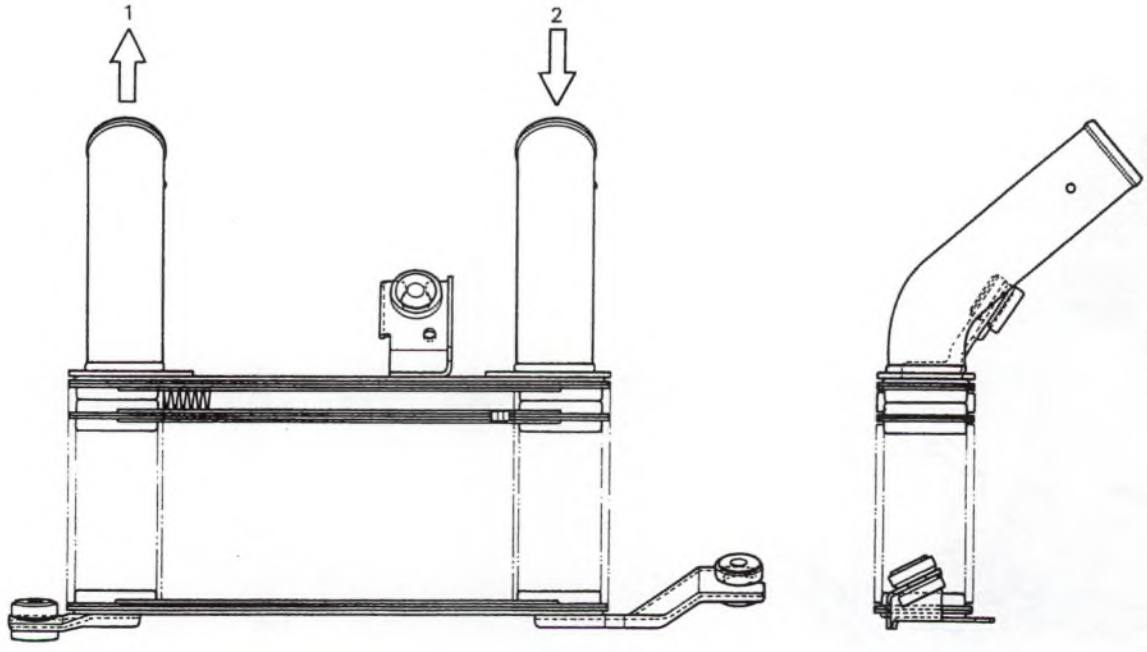
WASTE GATE VALVE

The air compressed by the compressor is also drawn into the waste gate valve actuator. When the rising compressed air pressure (supercharged pressure) exceeds the spring force in the actuator, it pushes the diaphragm to the right in the figure at the left. As the rod is linked with the diaphragm, it also moves to the right to open the waste gate valve. Then a portion of the exhaust gas flows through the by-pass to the muffler without working on the turbine wheel. As a result, the exhaust gas to drive the turbine wheel becomes less and thus the revolution speed of the turbine and compressor wheel is reduced, and so is the compressed air pressure.
As described above, the compressed air pressure is controlled by the amount of the exhaust gas which works on the turbine wheel.

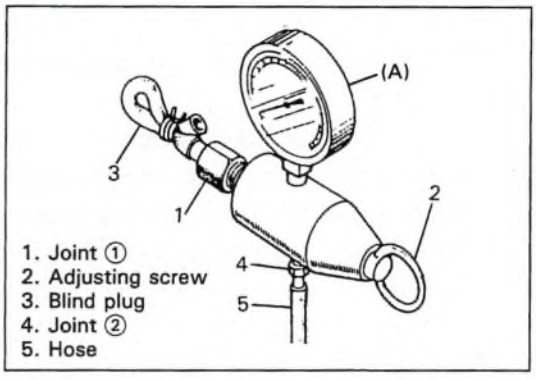
Waste gate valve opening pressure: 90 kPa (0.90 kg/cm²)

INTERCOOLER

As the supercharged air is warm and expanded, the intercooler cools and condenses it so as to improve the engine intake efficiency.



1. To throttle body
2. From turbocharger



1. Joint ①
2. Adjusting screw
3. Blind plug
4. Joint ②
5. Hose

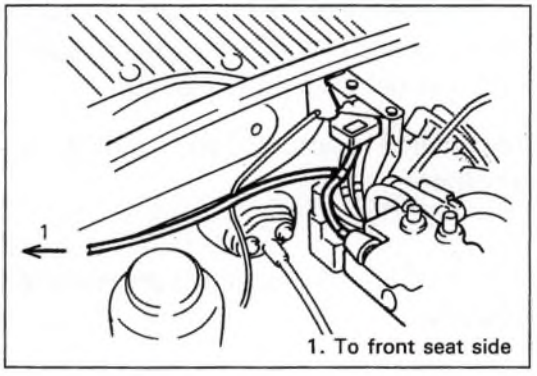
ON-VEHICLE SERVICE

INSPECTION

Supercharged Pressure

1) Fit blind plug to joint ① of air pressure regulator (special tool) and tighten adjusting screw all the way. Then connect 3-way joint connected hose (supplied with special tool) to joint ② .

Special Tool
(A): 09918-18110



1. To front seat side

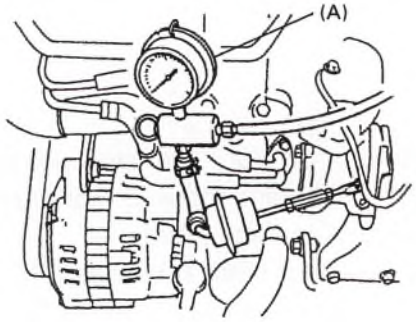
2) Position air pressure regulator on front seat side and lead 3-way joint connected hose to engine room. Be careful not to crush this hose with door or engine hood.
3) Disconnect MAP sensor vacuum hose from gas filter of surge tank and connect vacuum hose by means of 3-way joint.



4) After warming up engine, accelerate in the third gear position with throttle fully opened till engine speed reaches 4,500 r/min. In doing this, read supercharged pressure at 4,000 r/min engine speed.
If supercharged pressure then doesn't conform to specification, check intake/exhaust air systems for air leakage. If no leakage exists, replace turbocharger ass'y.

Supercharged pressure at 4,000 r/min: 80—90 kPa (0.8—0.9 kg/cm²)

WARNING:
- **Actual driving is required for this check. Select a safe place where no man or no running car is seen so as to prevent any accident.**
- **This test requires 2 persons, a driver and a tester.**



WASTE GATE VALVE

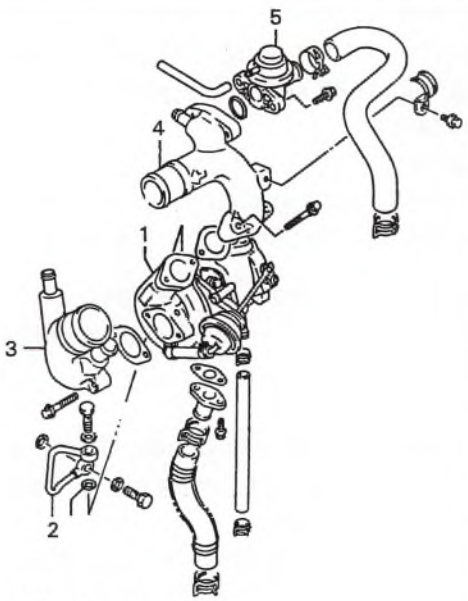
1) Disconnect waste gate valve actuator hose from compressor housing.
2) Connect air pressure regulator to actuator hose.
 Make sure that adjusting screw of air pressure regulator (special tool) is fully loosened and connect hose coming from external compressor to air pressure regulator.

 Special Tool
 (A): 09918-18110

3) Tighten adjusting screw gradually to apply 90 kPa (0.9 kg/cm²) pressure to actuator and check if actuator rod operates smoothly and then is held where it moved.

 Next, release pressure applied to actuator and check if rod returns to original position.

 NOTE:
 Never apply more than 110 kPa (1.1 kg/cm²) pressure to waste gate valve actuator.

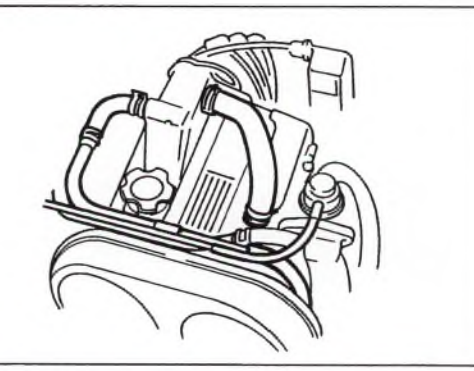


1. Turbocharger assembly
2. Oil intake pipe
3. Intake air pipe
4. Outlet air pipe
5. Air bypass valve

REMOVAL

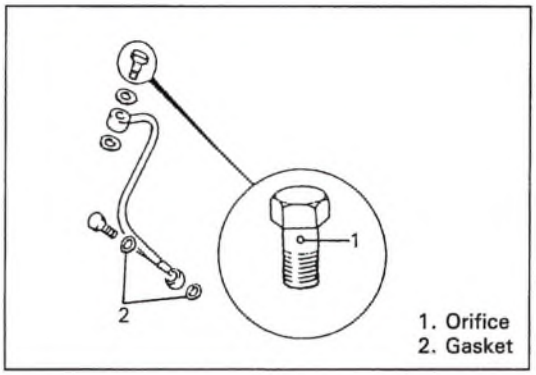
1) Disconnect negative cable at battery.
2) Drain engine coolant.
3) Remove exhaust center pipe No.1 turbocharger outlet pipe and other pipes/hoses from turbocharger.
4) Remove catalyst case.
5) Remove turbocharger assembly.

CAUTION:
- **Any time turbocharger is removed, intake and exhaust openings should be covered. This will protect against accidental entrance of foreign material which could cause extensive damage when engine is started.**
- **Be careful not to bend waste gate valve rod.**



PIPES AND HOSES INSPECTION

Inspect turbocharger oil hoses and pipes, coolant hoses and pipes and air hoses and pipes for damage, deterioration and connection (leakage). If any defect is found, replace.

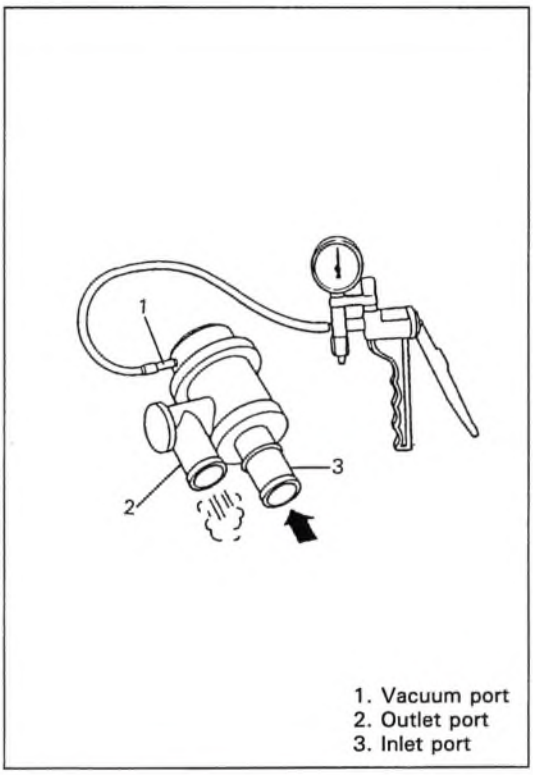


1. Orifice
2. Gasket

ORIFICES INSPECTION

Check to make sure that orifices in oil pipe and oil bolts are not clogged. If clogged orifice is found, clean by using compressed air.

NOTE:
Do not reuse gaskets once removed. Be sure to use new gaskets and apply engine oil before installing them.

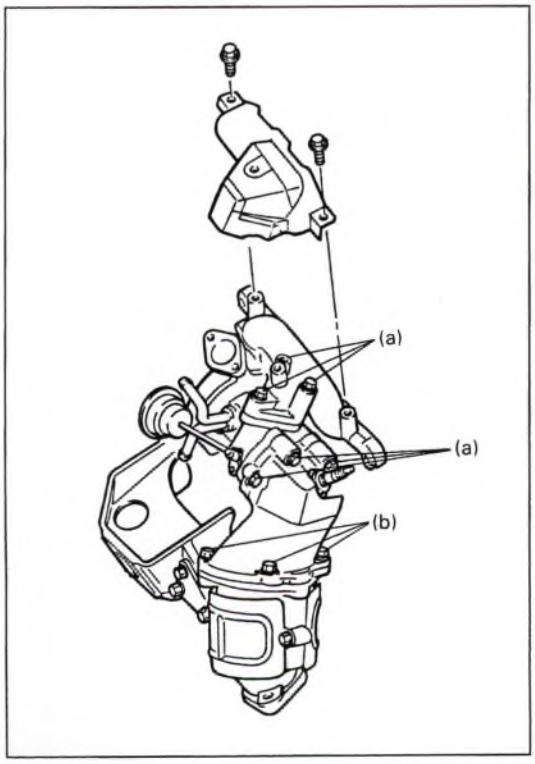


1. Vacuum port
2. Outlet port
3. Inlet port

AIR BYPASS VALVE INSPECTION

1) Disconnect inlet hose outlet hose and vacuum hose from air bypass valve.
2) Connect vacuum pump gauge as shown in figure at the left.
3) Apply 100 mmHg vacuum to vacuum port. In this state, blow inlet port. Air should come out of outlet port.
 If check result is not as described above, replace air bypass valve.

 NOTE:
 Never apply more than 200 mmHg vacuum to air bypass valve, or air bypass valve will be damaged.



INSTALLATION

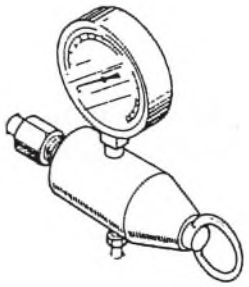
Install in reverse order of removal procedure noting following points.

- Tighten bolts and nuts to specified torque.

 Tightenint Torque
 (a): 18—28 N·m (1.8—2.8 kg-m)
 (b): 40—50 N·m (4.0—5.0 kg-m)

- For installation procedure of exhaust manifold, refer to SECTION 6A.
- After installation, start engine and keep it idling for longer than 1 minute so that bearing of the turbocharger is fully lubricated.

SPECIAL TOOL



09918-18110
Air pressure regulator

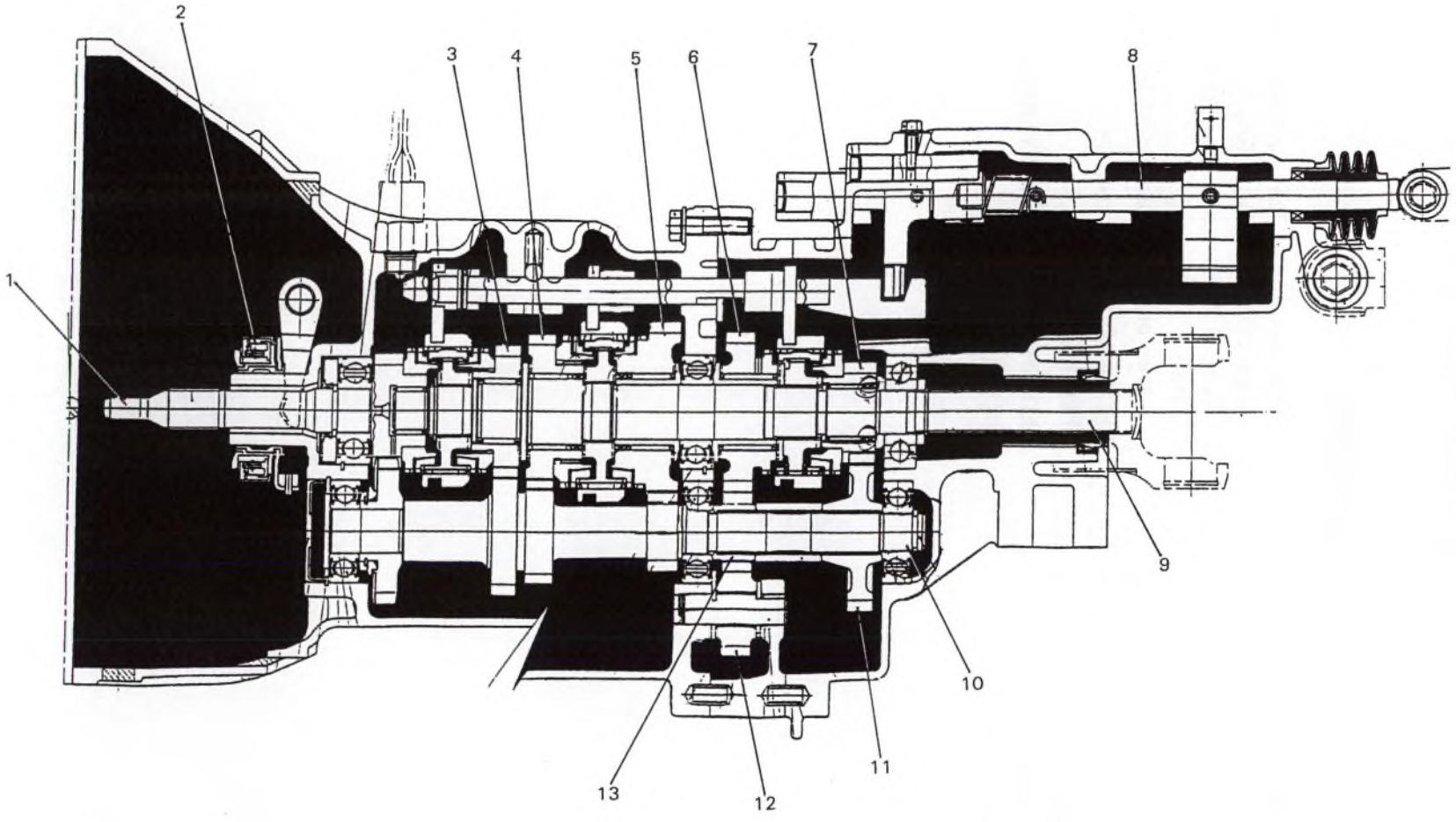
SECTION 7A

MANUAL TRANSMISSION

CONTENTS

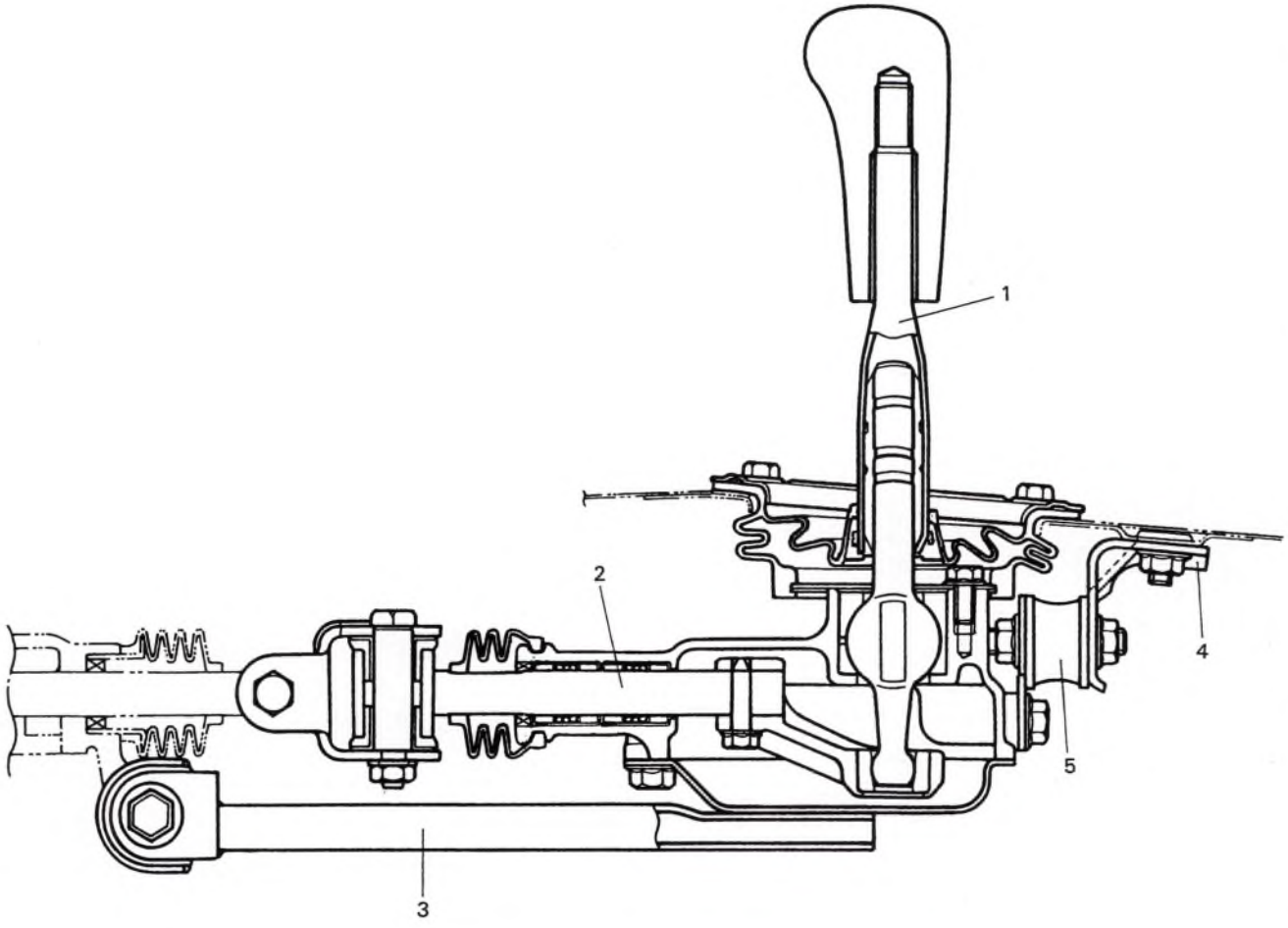
GENERAL DESCRIPTION 7A- 2
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GENERAL DESCRIPTION

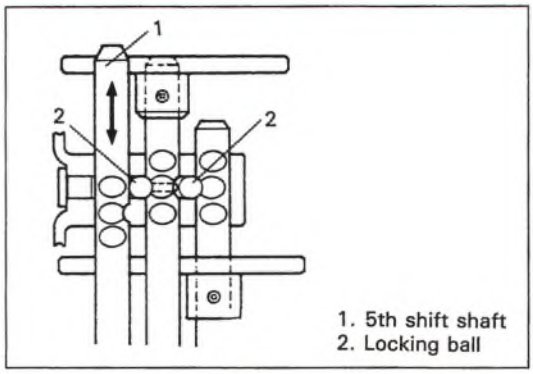


1. Input shaft
2. Clutch release bearing
3. Third gear
4. Second gear
5. Low gear
6. Reverse gear
7. Fifth gear
8. Gear shift front shaft
9. Main shaft
10. Counter shaft
11. Counter shaft 5th gear
12. Reverse idle gear
13. Counter shaft reverse gear

GEAR SHIFT CONTROL



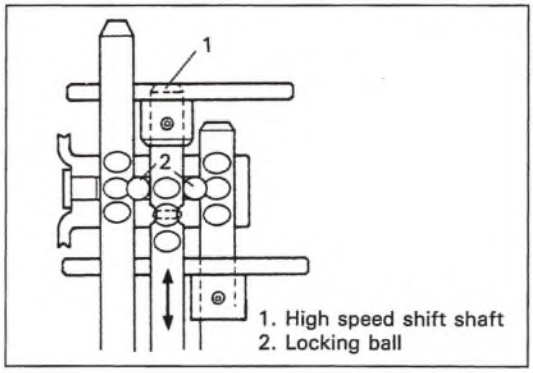
1. Control lever
2. Gear shift shaft
3. Extension rod
4. Braket
5. Mounting



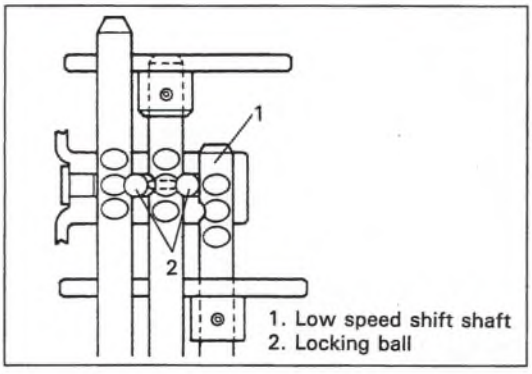
INTERLOCK SYSTEM (DOUBLE ENGAGEMENT PREVENTIVE SYSTEM)

Interlock system is provided to prevent double engagement from occurring between two shift shafts next to each other operating simultaneously.

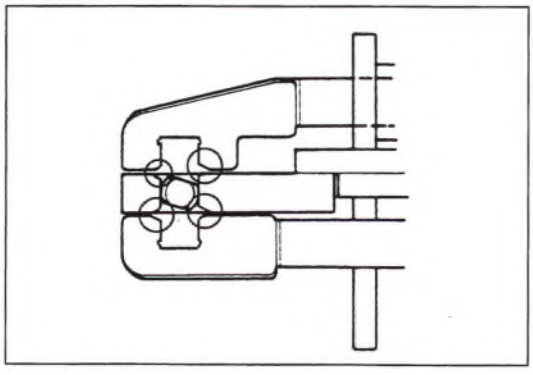
- When shifting to 5th gear or reverse gear.



- When shifting to 3rd gear or 4th gear.



- When shifting to low or 2nd gear.

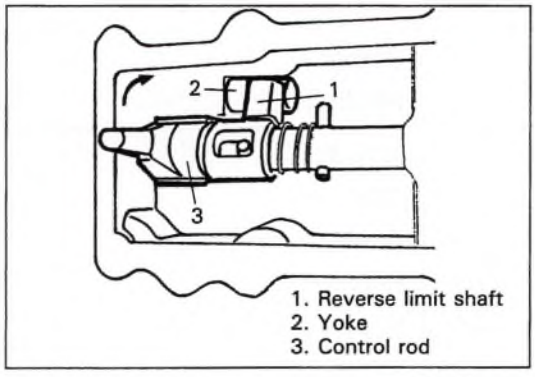


SHIFT FORK SHAFT

Cuts are provided as shown in figure to make smooth shifting possible.

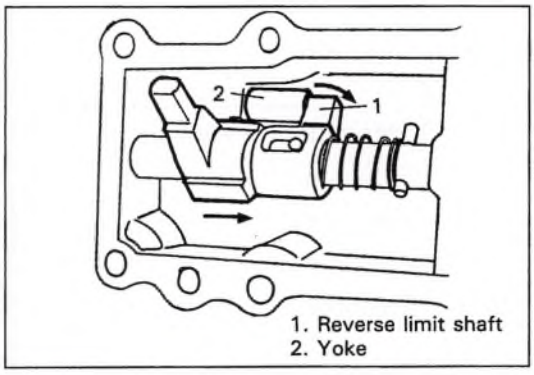
REVERSE MALFUNCTION PREVENTIVE SYSTEM

Gear shifting from 5th gear to reverse gear is not allowed by structure, thus preventing malfunction.



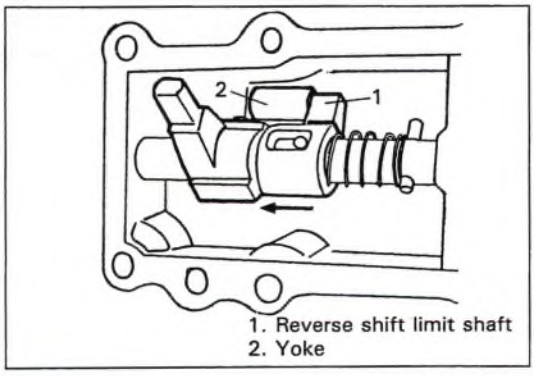
1. Reverse limit shaft
2. Yoke
3. Control rod

1) When shift lever is selected toward 5th gear and reverse gear side, reverse limit shaft contacts yoke and only control rod turns clockwise.



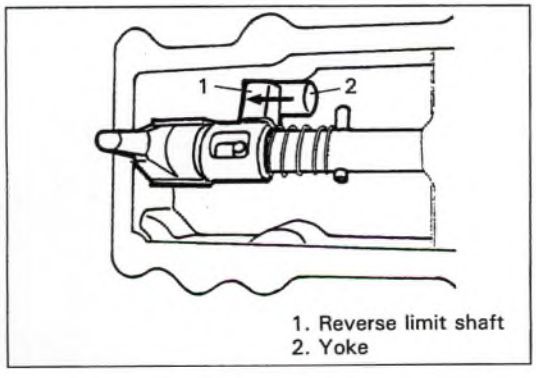
1. Reverse limit shaft
2. Yoke

2) When shift lever is shifted to 5th gear, reverse limit shaft moves rearward, is disengaged from yoke and turned clockwise by spring force.



1. Reverse shift limit shaft
2. Yoke

3) When shifting to reverse gear is attempted in this state, reverse limit shaft contacts yoke and shift lever cannot be shifted.

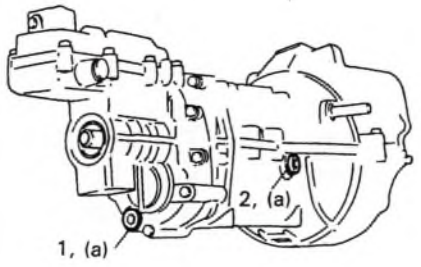


1. Reverse limit shaft
2. Yoke

4) When shift lever is returned to neutral position, reverse limit shaft returns to original position and gets under yoke. In this way, shift lever can be shifted to reverse gear.

DIAGNOSIS

Condition	Possible Cause	Correction
Gears slipping out of mesh	• Worn shift fork shaft	Replace.
	• Worn shift fork or synchronizer sleeve	Replace.
	• Weaken or damaged locating spring	Replace.
	• Worn bearings on input shaft or mainshaft	Replace.
	• Worn chamfered tooth on sleeve or gear	Replace sleeve and gear.
	• Missing or disengagement of circlip(s)	Install.
Gears refusing to disengage	• Weakened or broken synchronizer spring	Replace.
	• Distorted shift shaft or shift fork	Replace.
Hard shifting	• Improper clutch pedal free travel	Adjust.
	• Distorted or broken clutch disc	Replace.
	• Damaged clutch pressure plate	Replace clutch cover.
	• Worn synchronizer ring	Replace.
	• Worn chamfered tooth on sleeve or gear	Replace sleeve and gear.
	• Faulty contact between synchronizer ring and gear cone	Replace.
	• Deterioration or damage of synchronizer key or key spring	Replace.
Noise	• Improper or insufficient lubricant	Replenish or replace.
	• Damaged or worn bearing(s)	Replace.
	• Damaged or worn gear(s)	Replace.
	• Damaged or worn synchronizer ring	Replace.
	• Damaged or worn chamfered tooth on sleeve or gear	Replace.
	• Excessive backlash of each gear	Replace.
	• Entry of foreign matter	Wash or replace.



1. Oil drain plug
2. Oil level plug

ON-VEHICLE SERVICE

OIL LEVEL

1) Remove oil level plug and check that oil is filled up to mouth of level plug.
2) If oil level is below above specification, fill oil as specified below up to mouth of oil level plug.

Oil specification: API GL-4 SAE 75W-90

OIL CHANGE

1) Warm up engine to normal operating temeprature.
2) Drain transmission oil by removing drain plug.
3) Apply sealant to drain plug, and tighten it to specified torque.

Tightening Torque
(a): 20—30 N·m (2.0—3.0 kg-m)

Sealant "A": 99000-31110

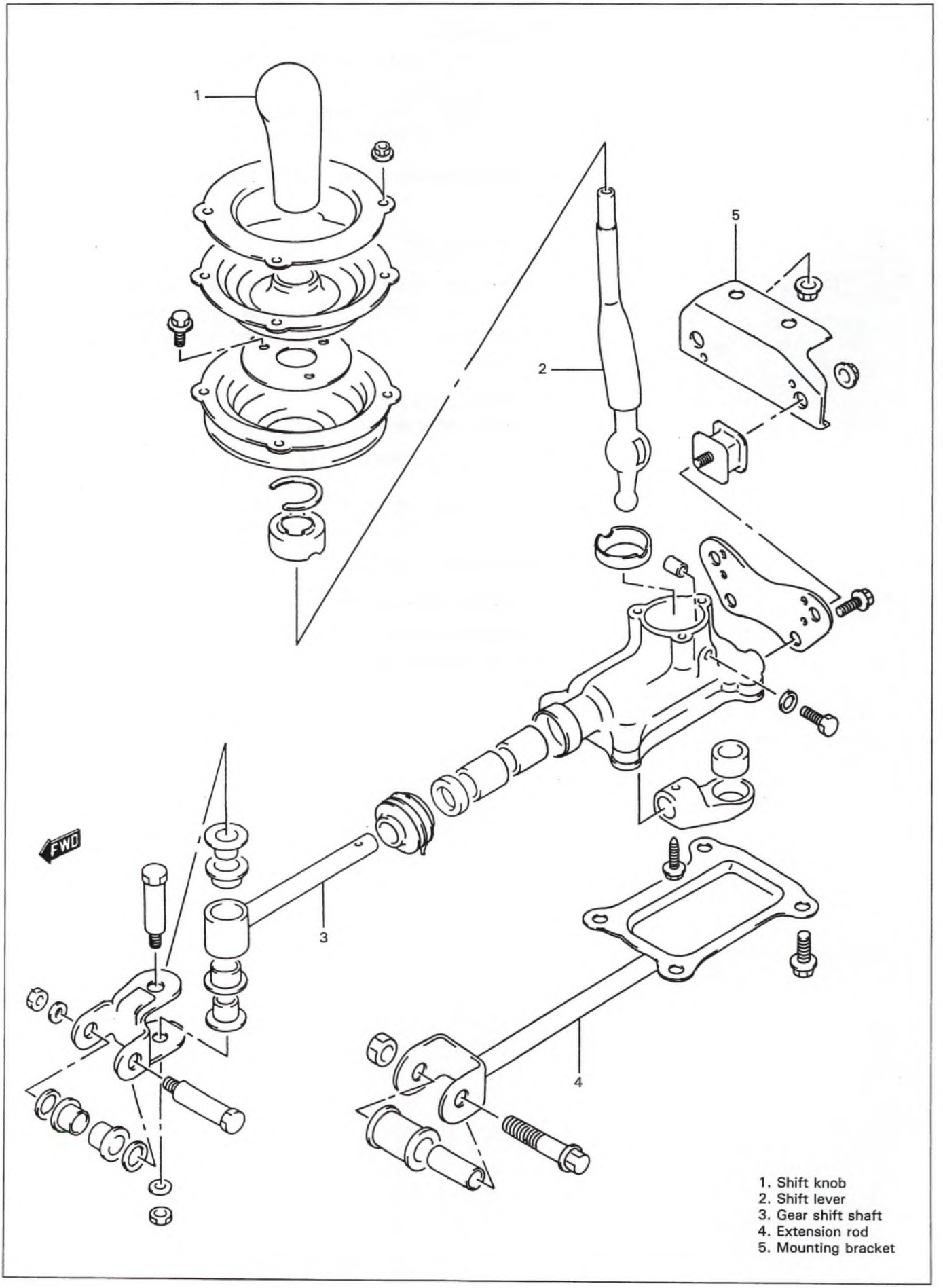
4) Fill specified amount of specified gear oil from oil level plug hole and tighten oil level plug to specified torque.

Oil capacity: 1.06 L

Oil Specification: API GL-4 SAE 75W-90

Tightening Torque
(a): 20—30 N·m (2.0—3.0 kg-m)

GEAR SHIFT CONTROL

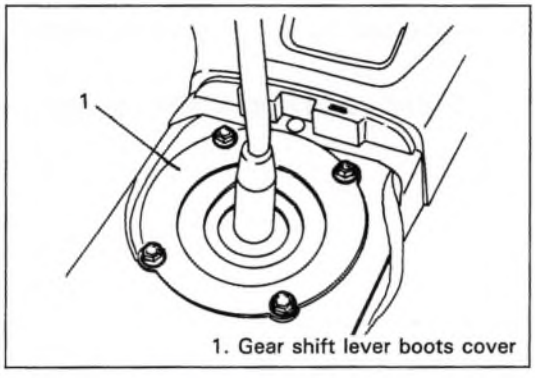


1. Shift knob
2. Shift lever
3. Gear shift shaft
4. Extension rod
5. Mounting bracket

REMOVAL

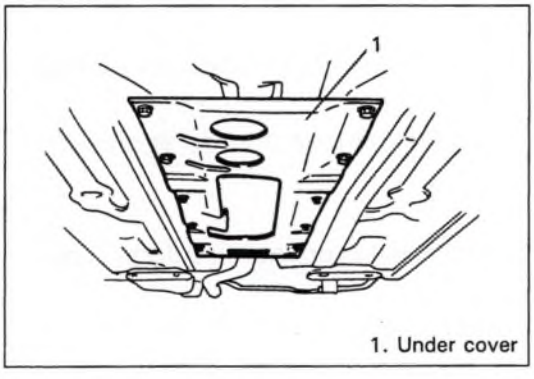
Before servicing, drain transmission oil.

1) Remove shift knob.
2) Lift center console and disconnect room light switch and power window switch couplers. And then remove center console.



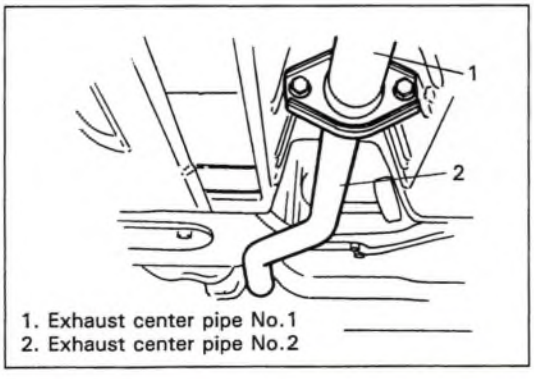
1. Gear shift lever boots cover

3) Remove gear shift lever boots cover.



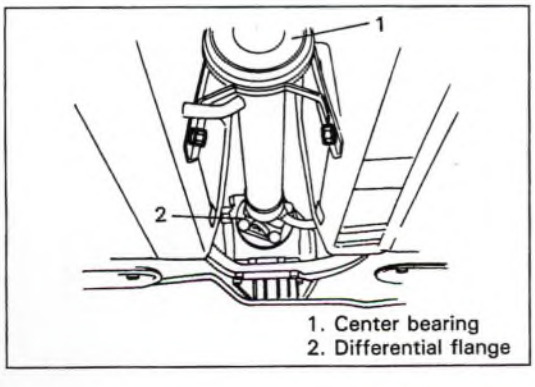
1. Under cover

4) Hoist vehicle and remove under cover.



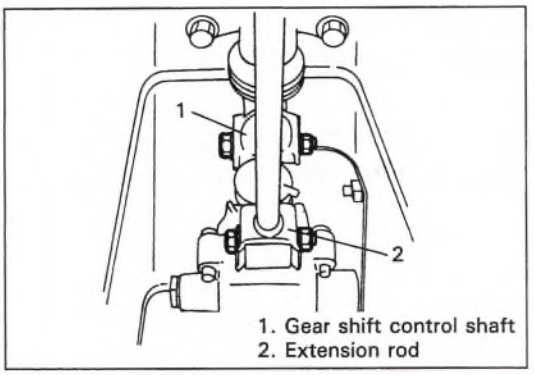
1. Exhaust center pipe No.1
2. Exhaust center pipe No.2

5) Remove exhaust center pipes No.1 and No.2
6) Remove center tunnel cover.



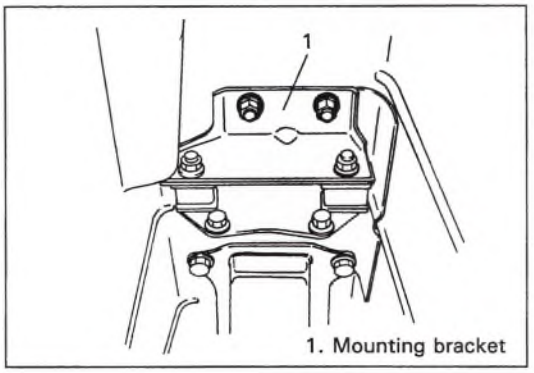
1. Center bearing
2. Differential flange

7) Remove center bearing mounting bolts and differential flange bolts. And then remove propeller shaft.



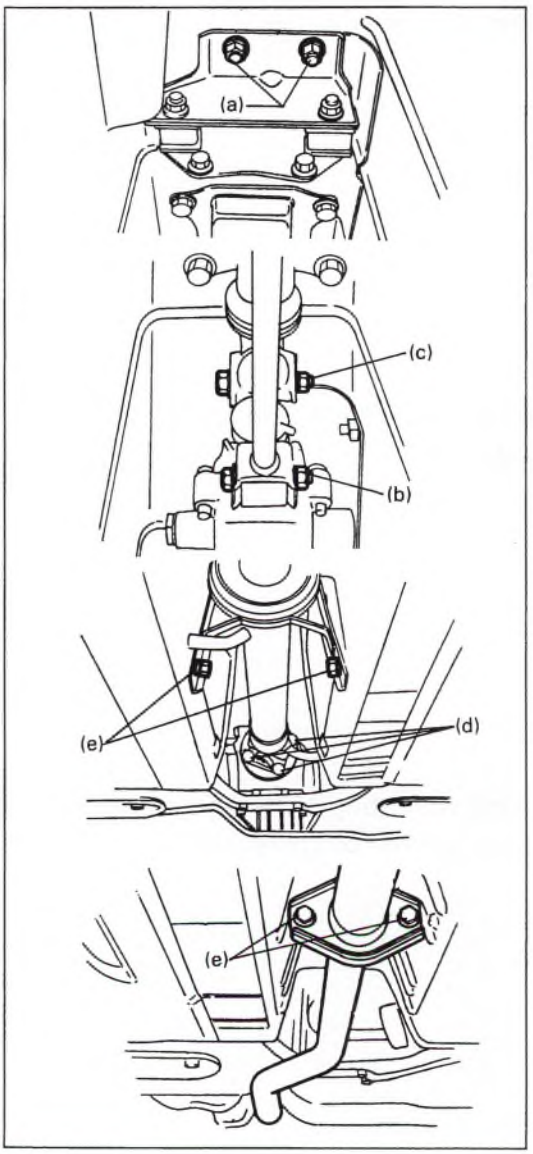
1. Gear shift control shaft
2. Extension rod

8) Remove gear shift control shaft and extension rod from transmission.



1. Mounting bracket

9) Remove rear side mounting bracket of gear shift control housing.
10) Take out gear shift control housing from under the floor.



INSPECTION

- Check that gear shift control lever moves smoothly without abnormal noise.
- Check bushes and boots for damage and deterioration.

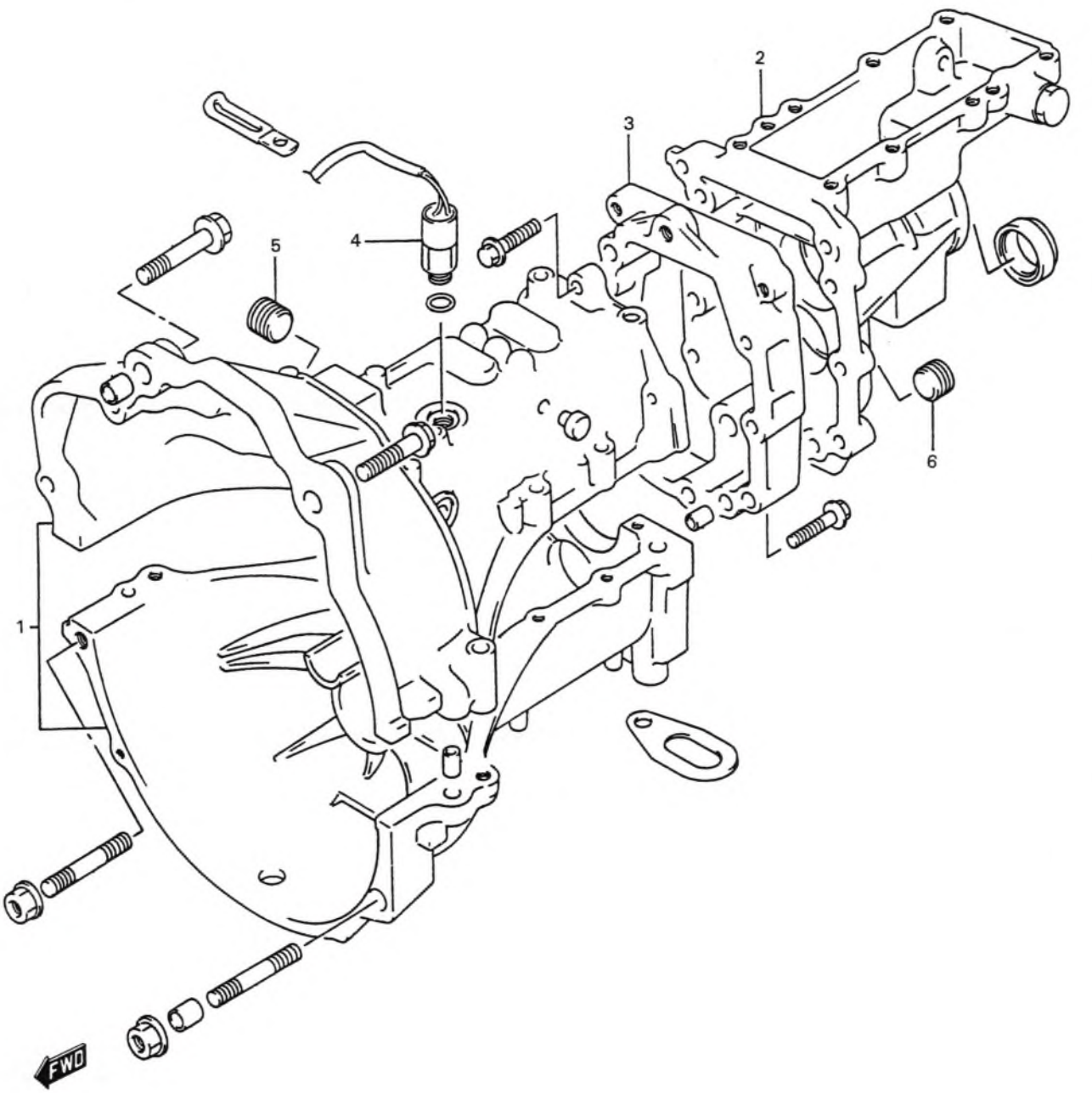
INSTALLATION

Install in reverse order of removal procedure noting following point.
Torque bolts to specifications, as given below.

Tightening Torque

(a): 18—20 N·m (1.8—2.0 kg-m)
(b): 40—60 N·m (4.0—6.0 kg-m)
(c): 15—20 N·m (1.5—2.0 kg-m)
(d): 18—21 N·m (1.8—2.1 kg-m)
(e): 41—61 N·m (4.1—6.1 kg-m)

UNIT REPAIR OVERHAUL

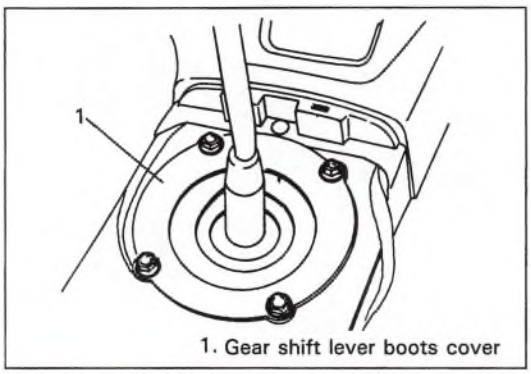


1. Transmission case assembly
2. Extension case No.1
3. Extension case No.2
4. Back-up light switch
5. Oil level plug
6. Oil drain plug

DISMOUNTING OF TRANSMISSION UNIT

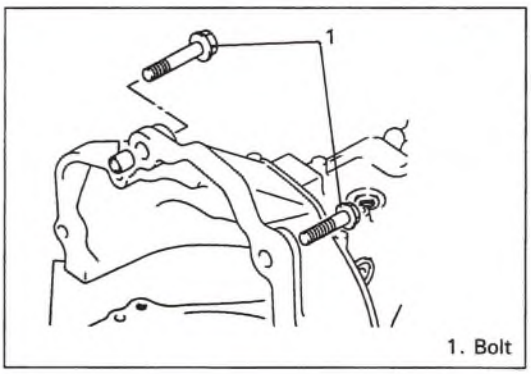
NOTE:
Before servicing, drain transmission oil

1) Disconnect negative cable at battery.
2) Remove center console. (Refer to previous page.)



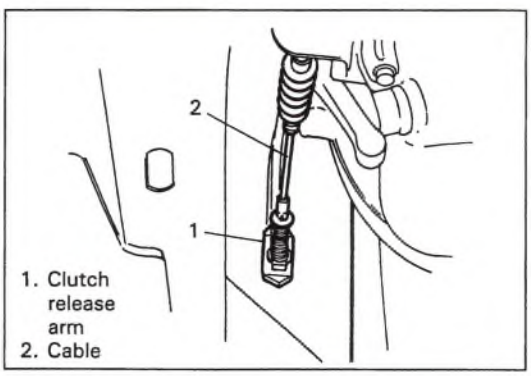
1. Gear shift lever boots cover

3) Remove gear shift lever boots cover.



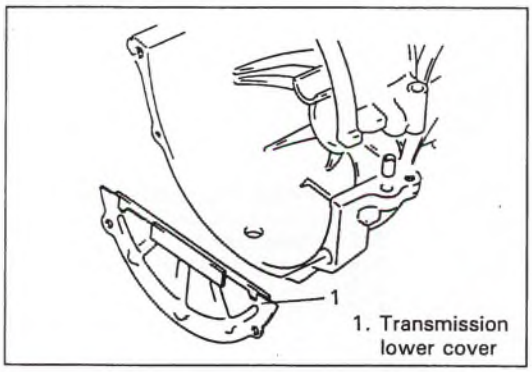
1. Bolt

4) Remove upper side of starting motor mounting bolt with clamp.
5) Disconnect back-up light switch lead wire at coupler.
6) Remove upper side transmission mounting bolts (2 pcs).
7) Hoist vehicle.



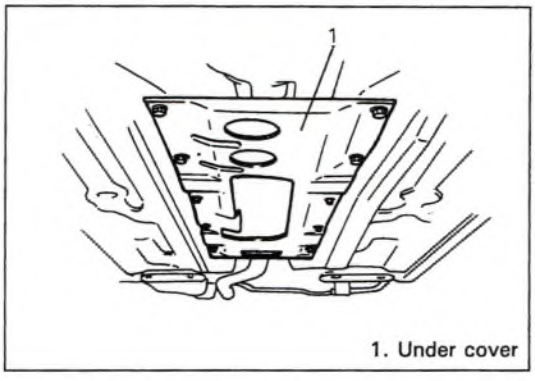
1. Clutch release arm
2. Cable

8) Disconnect clutch cable and remove clutch release arm.



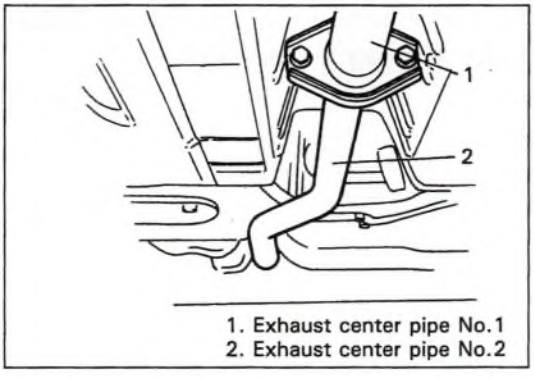
1. Transmission lower cover

9) Remove lower side of starting motor mounting bolt with ground terminal.
10) Remove transmission lower cover ty removing two bolts.



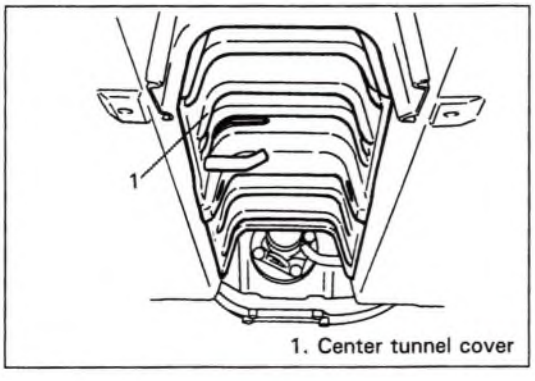
1. Under cover

11) Remove under cover.



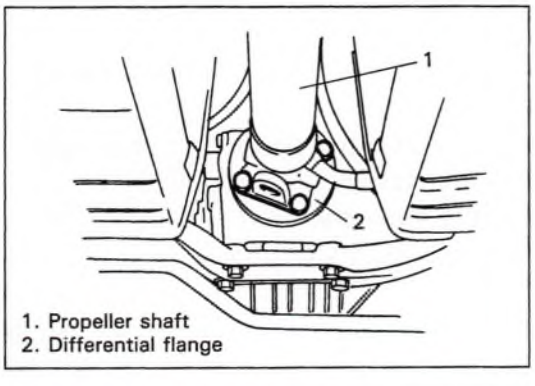
1. Exhaust center pipe No.1
2. Exhaust center pipe No.2

12) Remove exhaust center pipes No.1 and No.2



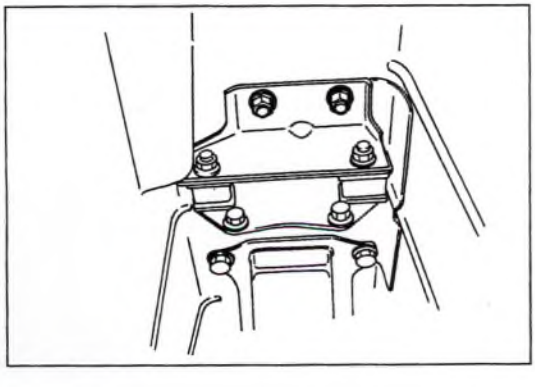
1. Center tunnel cover

13) Remove center tunnel cover.

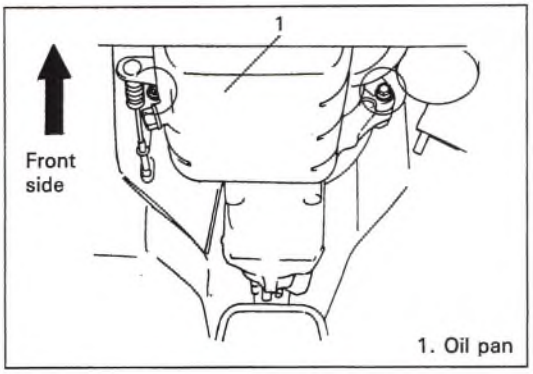


1. Propeller shaft
2. Differential flange

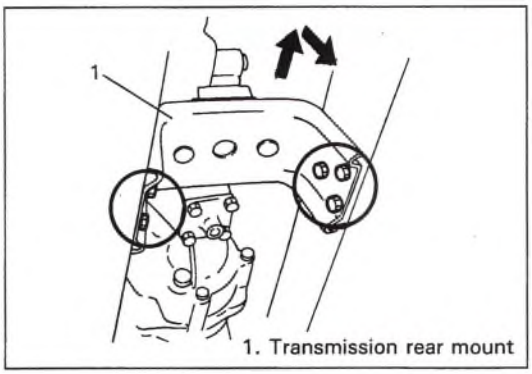
14) Give match marks on joint flange and propeller shaft before removal.
Remove center bearing mounting bolts and differential flange bolts. And then remove propeller shaft.



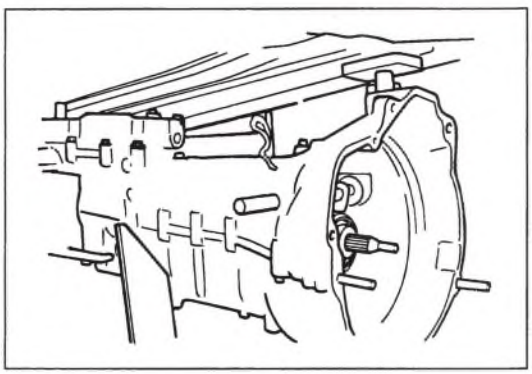
15) Remove gear shift control housing. (Refer to previous page.)



16) Remove lower side transmission mounting nut (2pcs.).



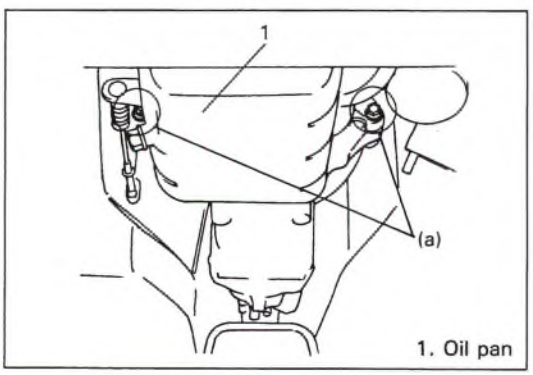
17) Remove bolts from transmission rear mount and take down transmission by moving it rearward.



REMOUNTING OF TRANSMISSION UNIT

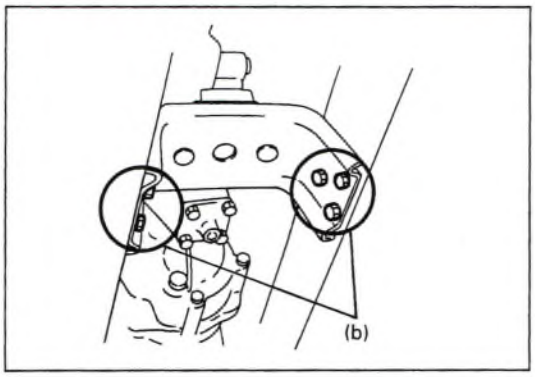
Remount in reverse order of dismounting procedure noting following points.

- Use care so that harness and other parts are not caught between engine and transmission.
- Set each clamp for wiring securely.
- Align splines of clutch and input shaft.

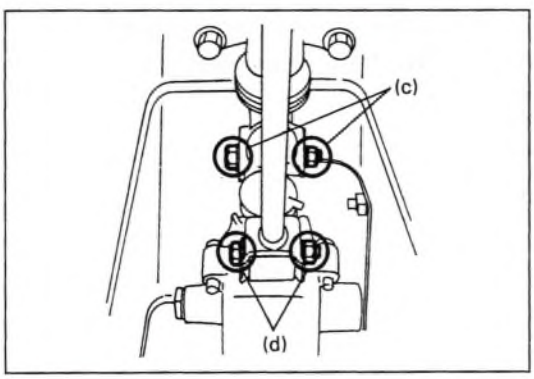


- Tighten bolts and nuts to specified torque.

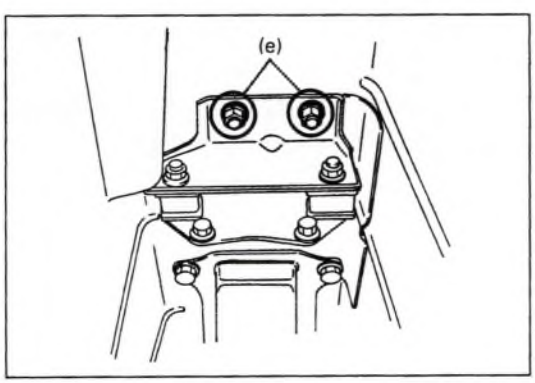
Tightening Torque
(a): 51—61 N·m (5.1—6.1 kg-m)



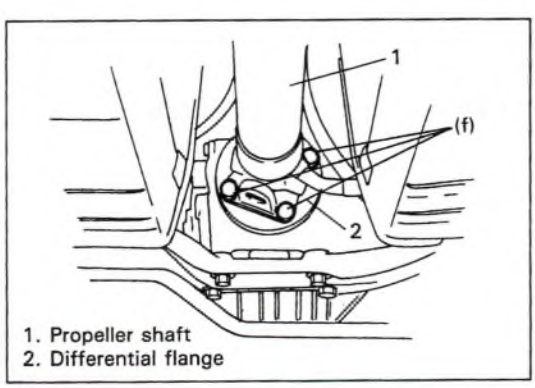
(b): 41—61 N·m (4.1—6.1 kg-m)



(c): 15—20 N·m (1.5—2.0 kg-m)
(d): 40—60 N·m (4.0—6.0 kg-m)



(e): 20—26 N·m (2.0—2.6 kg-m)



1. Propeller shaft
2. Differential flange

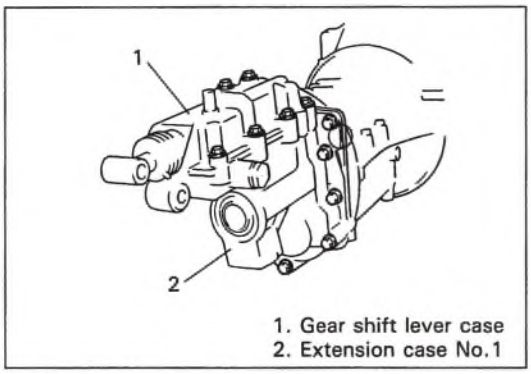
(f): 18—21 N·m (1.8—2.1 kg-m)

Align match marks on joint flange and propeller shaft, or vibration may occur during driving.

Propeller shaft center bearing mounting bolt: 41—61 N·m (4.1—6.1 kg-m)

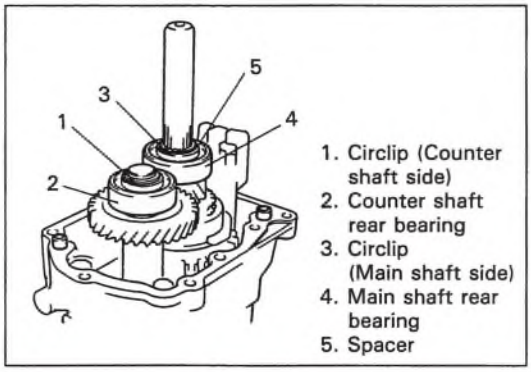
DISASSEMBLY OF TRANSMISSION UNIT

1) Remove release bearing and back-up light switch.



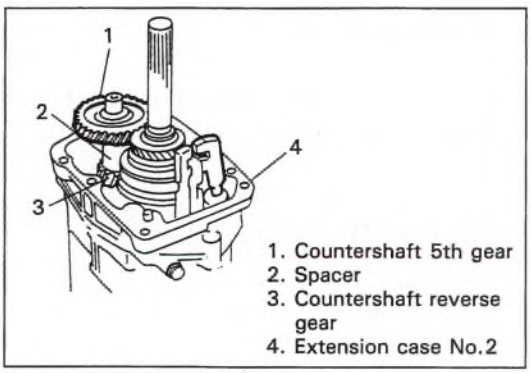
1. Gear shift lever case
2. Extension case No.1

2) Remove gear shift lever case by removing 8 bolts.
3) Remove extension case No.1 by removing 9 bolts.



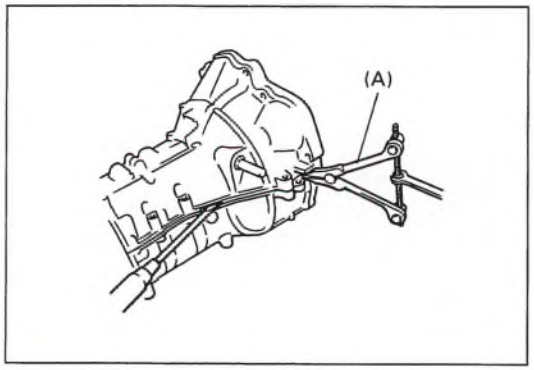
1. Circlip (Counter shaft side)
2. Counter shaft rear bearing
3. Circlip (Main shaft side)
4. Main shaft rear bearing
5. Spacer

4) Remove counter shaft side circlip. And remove countershaft rear bearing by using bearing puller.
5) Remove main shaft side circlip and spacer. And remove main shaft rear bearing by using bearing puller.



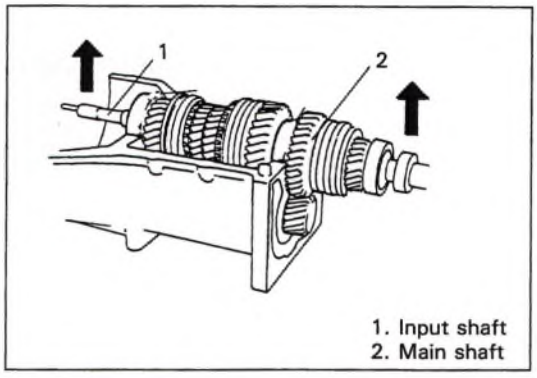
1. Countershaft 5th gear
2. Spacer
3. Countershaft reverse gear
4. Extension case No.2

6) Remove countershaft 5th gear, spacer and countershaft reverse gear by using bearing puller.
7) Remove extension case No.2 by removing 3 bolts.



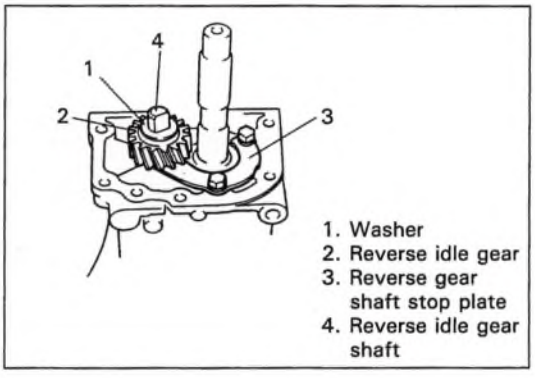
8) Remove 10 bolts and separate case by using special tool (A).

Special Tool
(A): 09912-34510



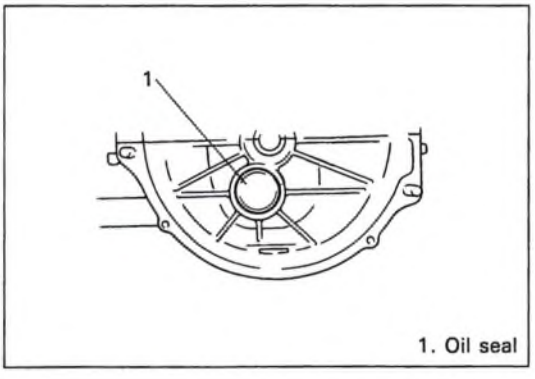
1. Input shaft
2. Main shaft

9) Remove input shaft and main shaft.
10) Remove bearing stopper ring.



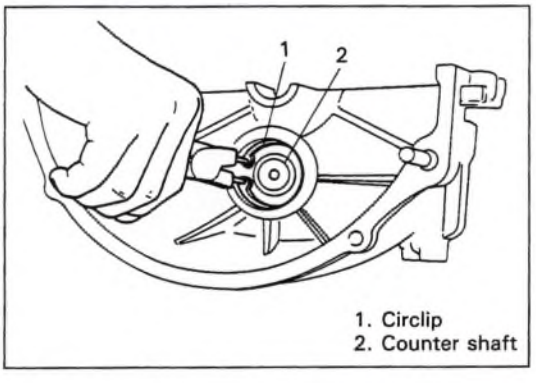
1. Washer
2. Reverse idle gear
3. Reverse gear shaft stop plate
4. Reverse idle gear shaft

11) Remove washer and remove reverse idle gear.
12) Remove reverse gear shaft stop plate by removing 2 bolts and remove reverse idle gear shaft.



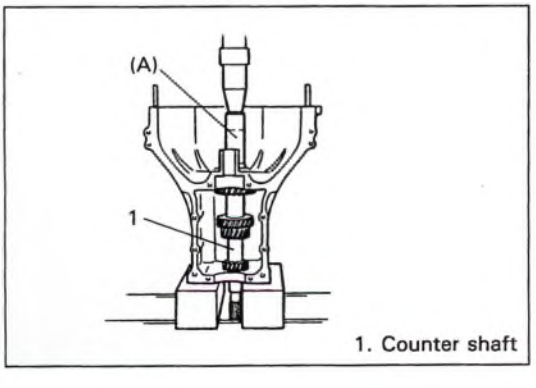
1. Oil seal

13) Remove oil seal from case.



1. Circlip
2. Counter shaft

14) Remove counter shaft front side circlip.



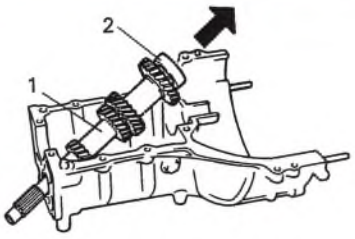
1. Counter shaft

15) Using press and special tool (A), drive counter shaft rearward.

NOTE:
Be sure to insert special tool (bearing installer) vertically.

Special Tool
(A): 09951-76010

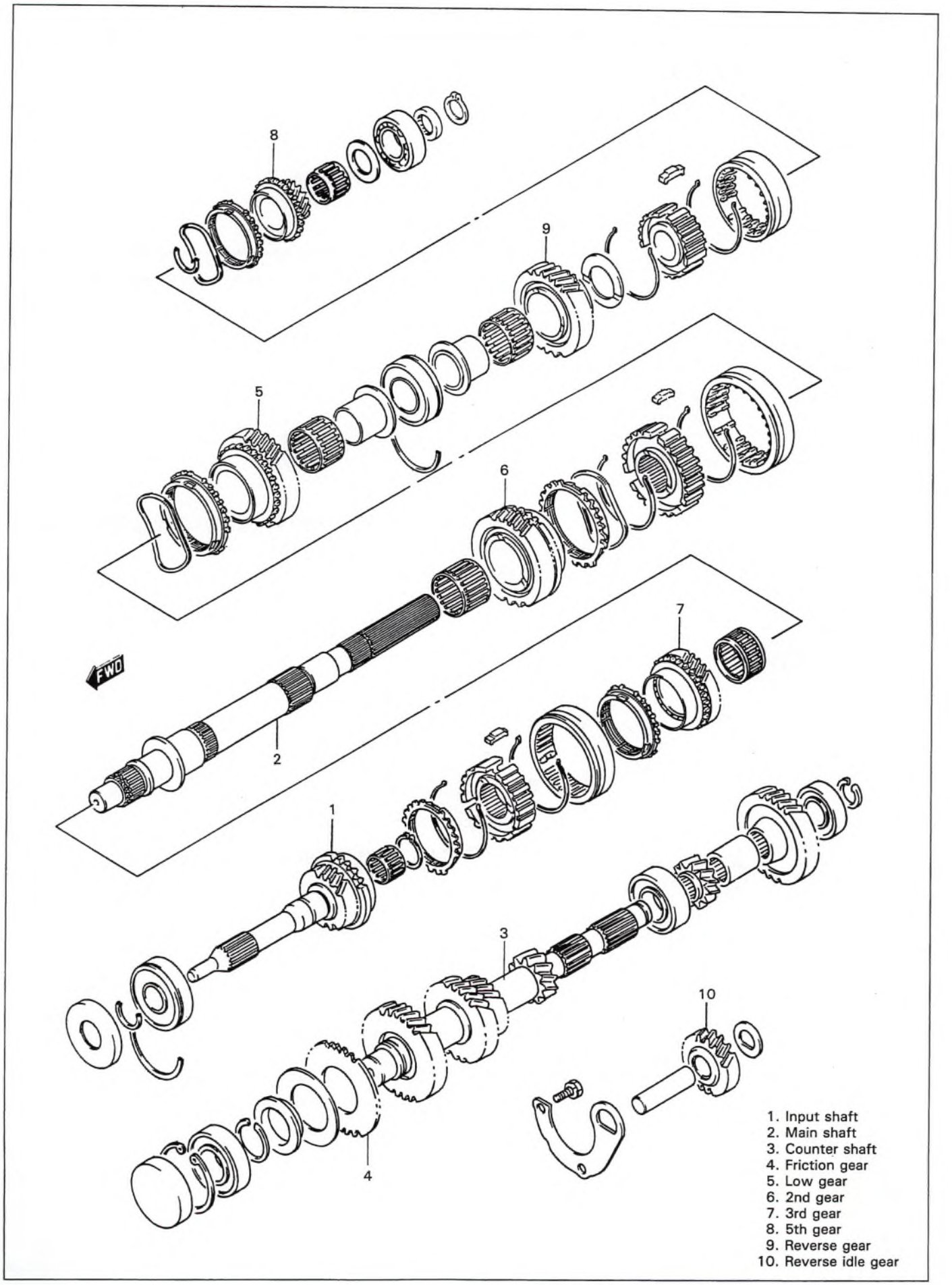
16) Using bearing puller, remove counter shaft rear bearing.



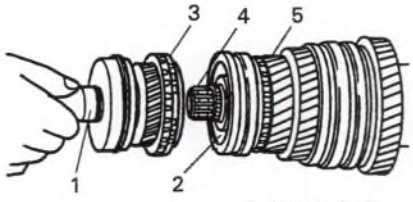
1. Countershaft
2. Counter shaft front bearing

17) Pull out counter shaft form lower case.
18) Remove counter shaft front bearing from counter shaft.

MAIN SHAFT AND INPUT SHAFT



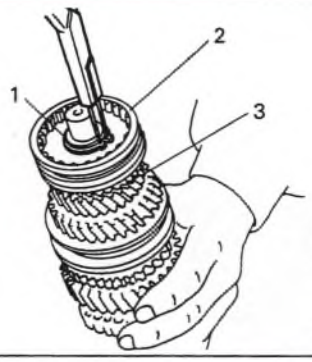
1. Input shaft
2. Main shaft
3. Counter shaft
4. Friction gear
5. Low gear
6. 2nd gear
7. 3rd gear
8. 5th gear
9. Reverse gear
10. Reverse idle gear



1. Input shaft
2. Main shaft
3. Synchronizer ring
4. Bearing
5. 3rd gear

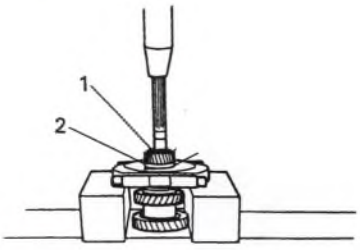
DISASSEMBLY

1) Separate input shaft and main shaft.
2) Remove input shaft synchronizer ring and bearing.



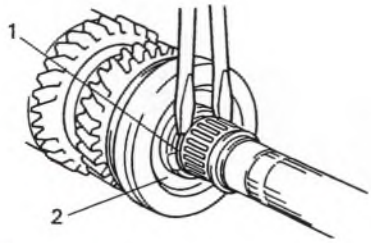
1. Circlip
2. High speed synchronizer sleeve
3. 3rd gear

3) Remove high speed synchronizer hub circlip and remove high speed synchronizer hub assembly and 3rd gear.



1. Washer
2. Main shaft 5th gear

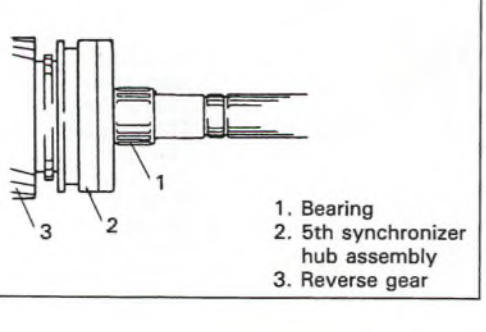
4) Remove circlip. And then using press and puller, remove washer and main shaft 5th gear.
5) Remove synchronizer ring.



1. Circlip
2. 5th synchronizer hub

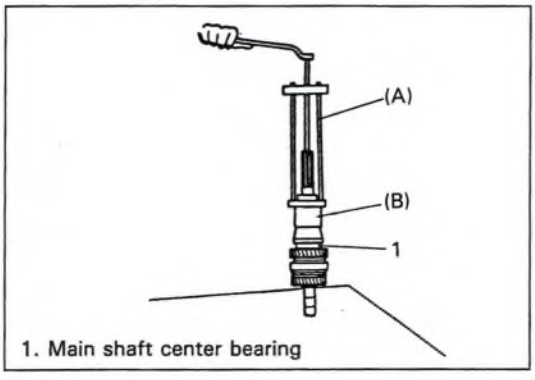
6) Remove circlip.

NOTE:
Don't reuse used circlips.



1. Bearing
2. 5th synchronizer hub assembly
3. Reverse gear

7) Remove bearing.
8) Remove 5th synchronizer hub assembly.
9) Remove main shaft reverse gear.
10) Remove bearing and bush.

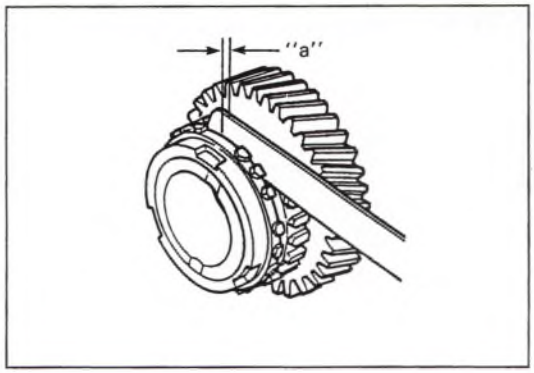


1. Main shaft center bearing

11) Remove main shaft center bearing by using special tools (A) and (B).

Special Tool
(A): 09941-84520
(B): 09941-84510

12) Remove main shaft low gear and synchronizer ring.
13) Remove low speed synchronizer hub assembly.
14) Remove main shaft second gear and synchronizer ring.
15) Remove bearings.

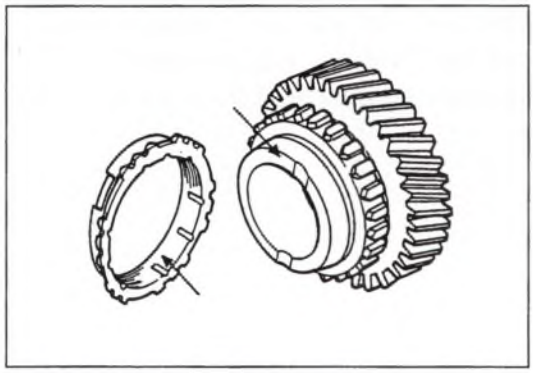


INSPECTION

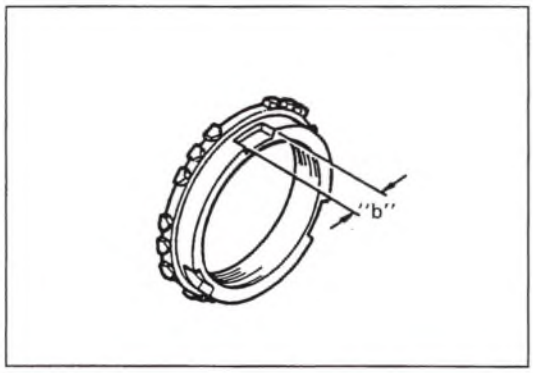
Combination of Gear and Synchronizer Ring

Fit the ring to the cone of the gear (top gear, or "fourth," "third," "second" or "low" gear), and measure the clearance between the two at the peripheral teeth, as shown in figure. If the clearance has reached or exceeds the service limit, replace the worn part.

Clearance "a": Standard 1.0 mm
Service limit 0.5 mm



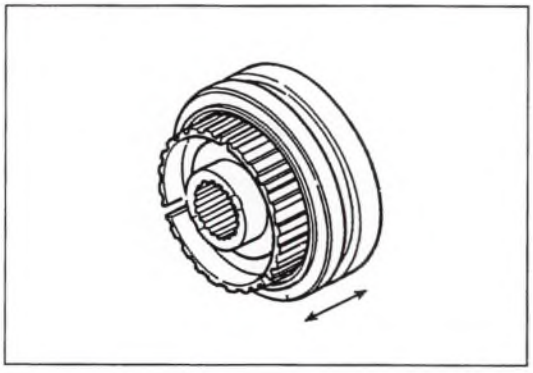
Inspect the external cone (of the gear) and internal cone (of the ring) for abnormal wear.
Be sure that the contact patterns on these surfaces indicate uniform full-face contact, and that the surfaces are from any wavy wear. A badly worn member must be replaced.
Proper synchronizing action on gear shifting can be expected when the ring-to-gear clearance and the condition of cone surfaces, among other things, are satisfactory.



Synchronizer Rings

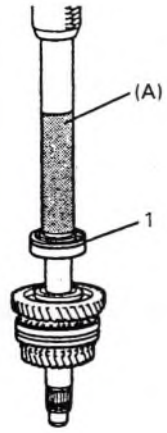
Inspect each synchronizer ring for key slot wear by measuring the width of each slot. If the width reading exceeds the limit, replace the ring.

Slot width "b": Standard 9.6 mm
Service limit 10.0 mm



Synchronizer Sleeve and Hub

1) Put synchronizer sleeve and hub together and check if sleeve moves smoothly.
2) Check end of hub for wear.



1. Ring groove (rear side)

ASSEMBLY

NOTE:

- **Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.**
- **Use new circlips on shaft for reinstallation. Don't reuse used circlips.**

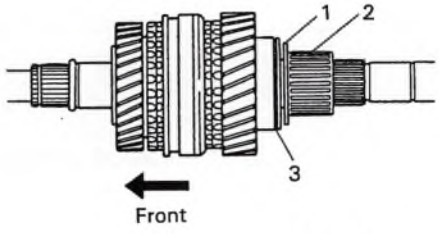
1) Install bearing and main shaft 2nd gear to main shaft.
2) Install synchronizer ring to low speed synchronizer hub assembly with their key slots aligned and install them to main shaft.

 NOTE:
 Synchronizer hub assembly should be installed with its larger chamfer side facing rearward.

3) Install main shaft low gear.
4) Install main shaft center bearing by using special tool (A) and press.

 Special Tool
 (A): 09925-18010

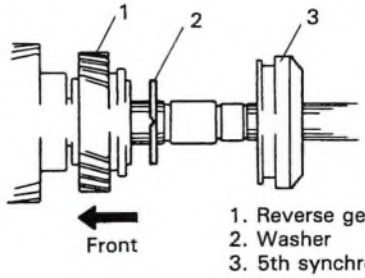
 NOTE:
 Refer to figure for proper installing direction of main shaft center bearing.



1. Bush
2. Bearing
3. Ring groove

5) Install bush and bearing.

 NOTE:
 Check to make sure that gears, sleeves, bearing and other parts are installed properly.



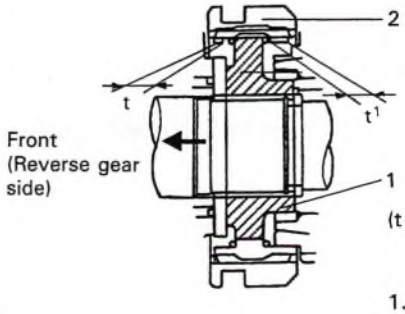
1. Reverse gear
2. Washer
3. 5th synchronizer hub assembly

6) Install main shaft reverse gear.

 NOTE:
 Reverse gear should be installed with its dog facing rearward.

7) Install washer.

 NOTE:
 Washer should be installed with its oil slot side facing reverse gear.

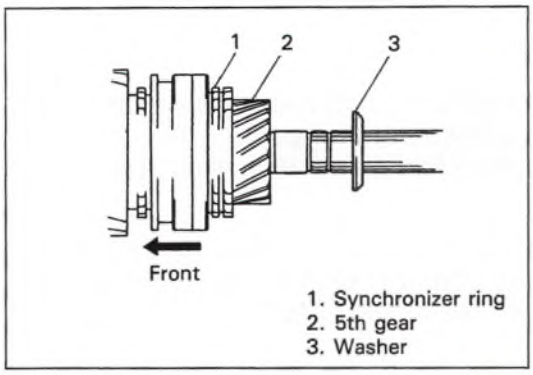


1. Hub
2. Sleeve

8) Install 5th synchronizer assembly.

 NOTE:
 5th synchronizer hub assembly should be installed with its larger chamfer side facing rearward.

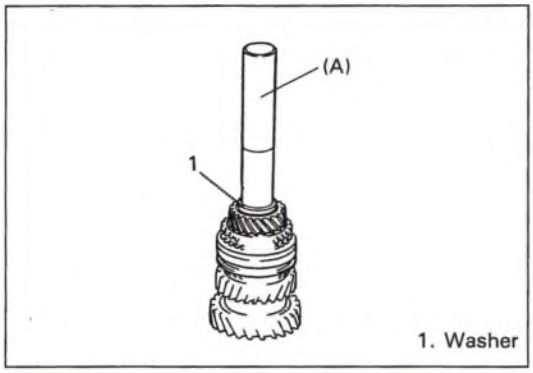
9) Install 5th synchronizer hub circlip.
10) Install synchronizer ring to hub assembly with key slots aligned.



1. Synchronizer ring
2. 5th gear
3. Washer

11) Install bearing.
12) Install 5th gear.
13) Install washer.

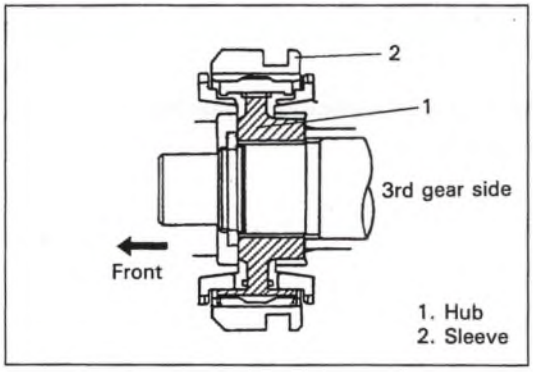
NOTE:
Check to ensure that washer is installed in correct direction.



1. Washer

14) Press-fit washer with special tool (A) and press.

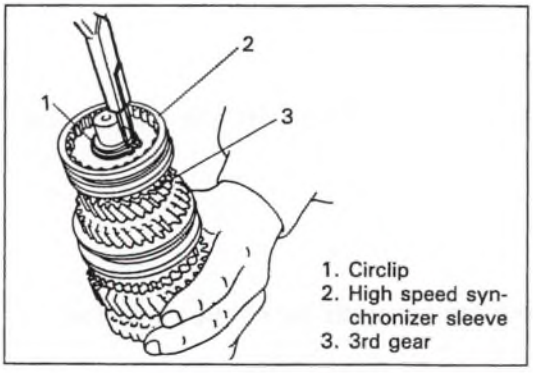
Special Tool
(A): 09913-80112



1. Hub
2. Sleeve

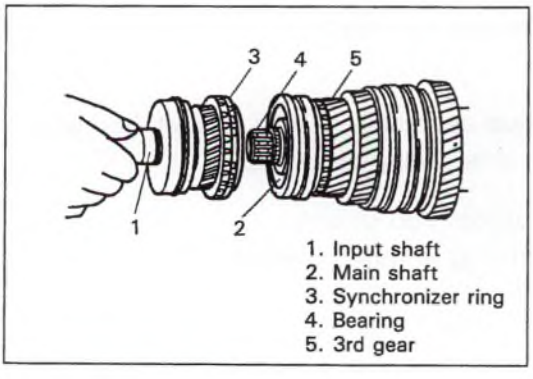
15) Install bearings (2 pcs.) and install 3rd gear.
16) Install high speed synchronizer ring to high speed synchronizer hub assembly.

NOTE:
High speed synchronizer ring should be installed with larger chamfer side facing rearward.



1. Circlip
2. High speed synchronizer sleeve
3. 3rd gear

17) Install high speed synchronizer hub circlip.



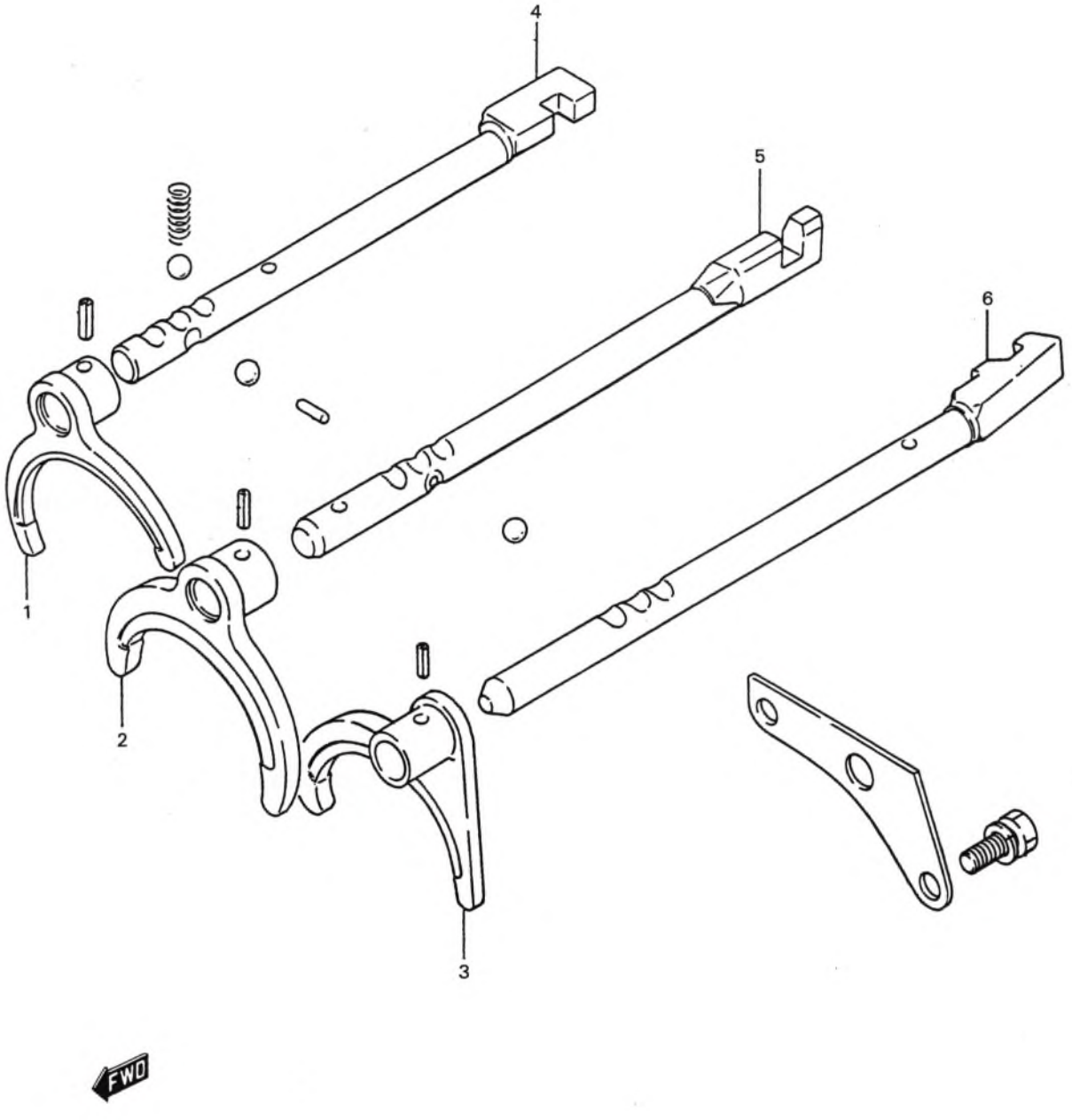
1. Input shaft
2. Main shaft
3. Synchronizer ring
4. Bearing
5. 3rd gear

18) Install bearing and synchronizer ring.

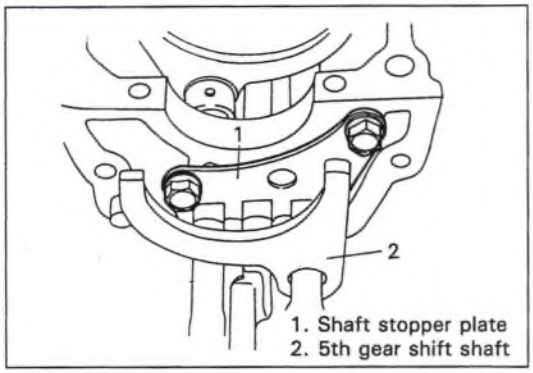
NOTE:
Key slots should be aligned when installing synchronizer ring.

19) Install input shaft.

GEAR SHIFT FORK AND GEAR SHIFT SHAFT



1. Low speed gear shift fork
2. High speed gear shift fork
3. 5th/reverse gear shift fork
4. Low speed gear shift shaft
5. High speed gear shift shaft
6. 5th/reverse gear shift shaft

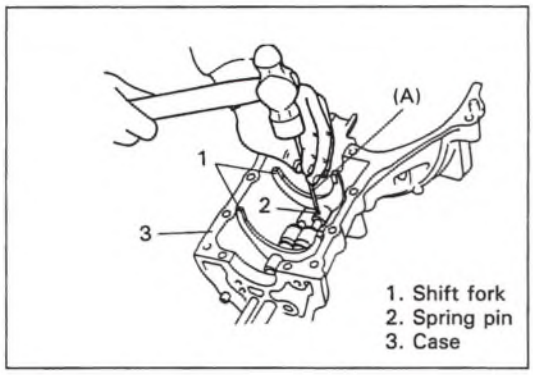


1. Shaft stopper plate
2. 5th gear shift shaft

DISASSEMBLY

1) Remove shaft stop plate by removing 2 bolts.
2) Remove 5th/reverse gear shift shaft.

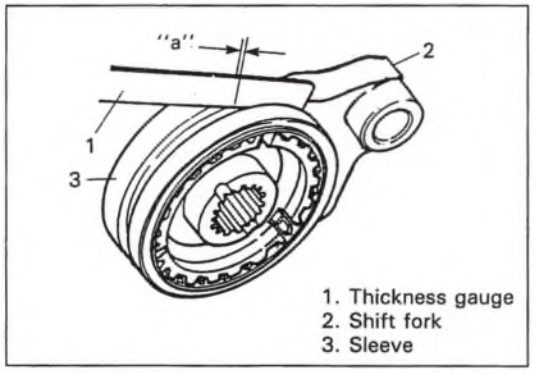
NOTE:
As this shaft comes out, locating ball and spring will jump out of hole; do not let them fly away.



1. Shift fork
2. Spring pin
3. Case

3) Remove 2 spring pins by using special tool (A) and pull out low speed gear shift shaft and high speed gear shift shaft.

Special Tool
(A): 09922-85811



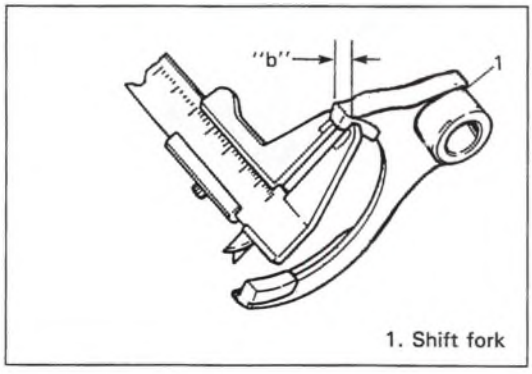
1. Thickness gauge
2. Shift fork
3. Sleeve

INSPECTION

Synchronizer Sleeve and Shift Fork

1) Measure clearance between sleeve and shift fork and if it exceeds its limit, check shift fork.

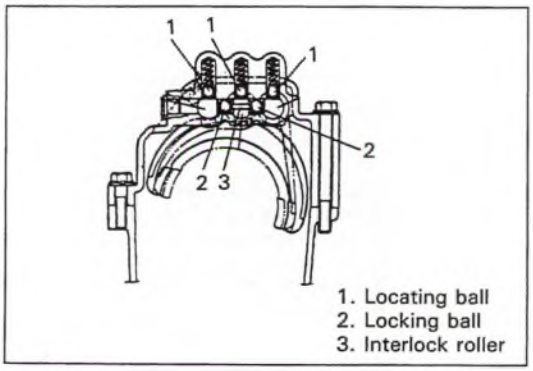
Sleeve-to-shift fork clearance "a"
Standard : 0.2—0.6 mm
Service limit: 1.0 mm



1. Shift fork

2) Measure thickness of claw part of shift fork and if it is less than its limit, replace.

Thickness of shift fork claw "b"
Standard : 5.6—5.8 mm
Service limit: 5.1 mm



1. Locating ball
2. Locking ball
3. Interlock roller

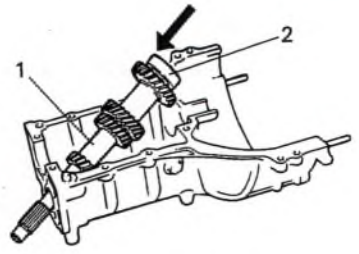
ASSEMBLY

Assemble in reverse order of disassembly procedure noting the following point.

- Be sure to install each shift shaft locating ball, locking balls and interlock roller.

ASSEMBLY OF TRANSMISSION UNIT

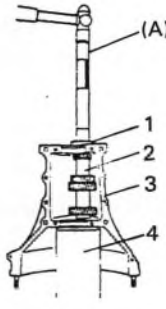
1) Install front side bearing to counter shaft. And then install counter shaft to lower case.



1. Counter shaft
2. Counter shaft front bearing

2) Using special tool, drive in counter shaft and center bearing simultaneously.

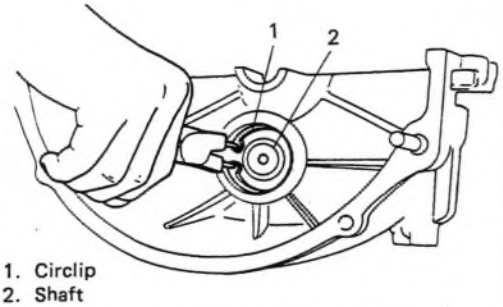
Special Tool
(A): 09925-18010



1. Center bearing
2. Counter shaft
3. Transmission lower case
4. Wooden stand

3) Install circlip to the front of case, using care for its installation direction.

NOTE:
When installing circlip, bring its deburred face inside (rear side).



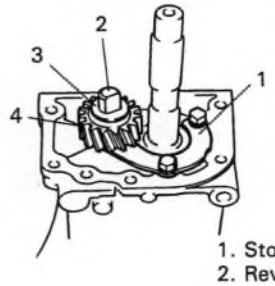
1. Circlip
2. Shaft

4) Install oil seal with Sealant "A" applied to press-fitting part at its external diameter.

NOTE:
Drive in oil seal till its surface becomes flush with surface of case.

5) Install reverse idle gear shaft and reverse gear shaft stop plate.
6) Apply oil to reverse idle gear shaft, and install reverse idle gear and washer.

NOTE:
Carefully check that gear and washer are installed in correct direction.



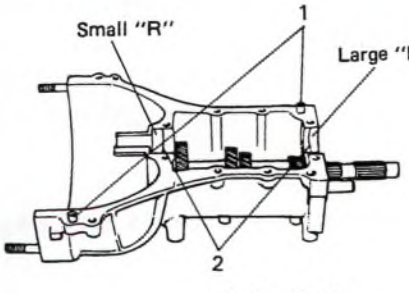
1. Stop plate
2. Reverse idle gear shaft
3. Washer
4. Reverse idle gear

7) Fit bearing stopper rings in ring grooves at the front and rear of lower case.

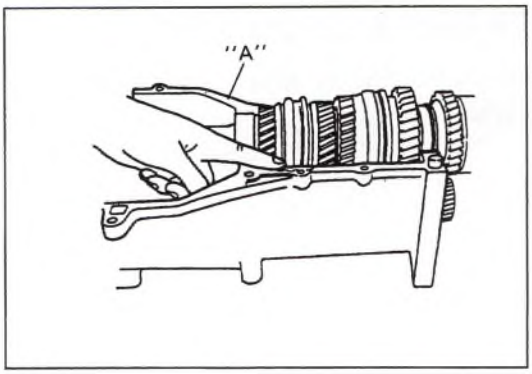
NOTE:
Carefully check radius size of rings.

8) Install input shaft and main shaft to lower case.

NOTE:
Lower case side stopper rings should be fitted in ring grooves in main shaft bearing and input shaft bearing.



1. Knock pin
2. Bearing stopper ring

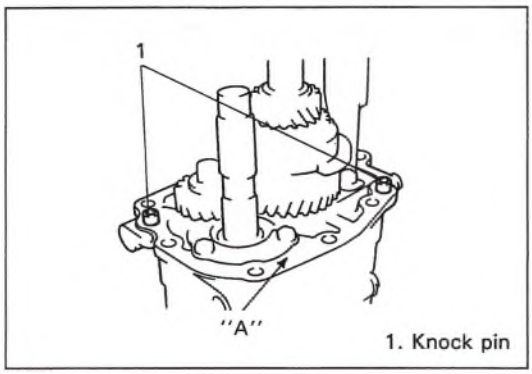


9) After cleaning mating surfaces of both cases, coat mating surface of lower case with sealant "A" evenly and put upper case over lower case. And tighten case bolts to specified torque.

"A": Sealant 99000-31110

Tightening Torque for case bolt: 18—28 N·m (1.8—2.8 kg-m)

NOTE:
Be sure to install knock pin.



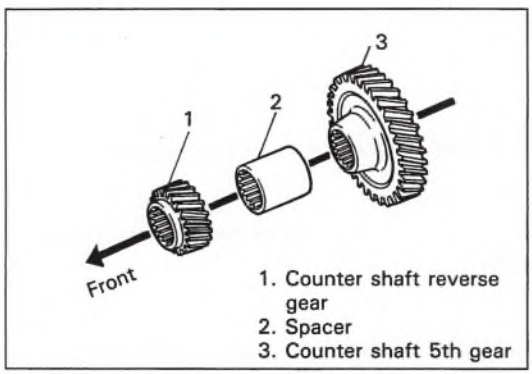
1. Knock pin

10) After cleaning mating surface of both cases, coat mating surface of transmission case with sealant "A" evenly and put extension case No.2 over upper case. And tighten case bolts (3 pcs.) to specified torque.

"A": Sealant 99000-31110

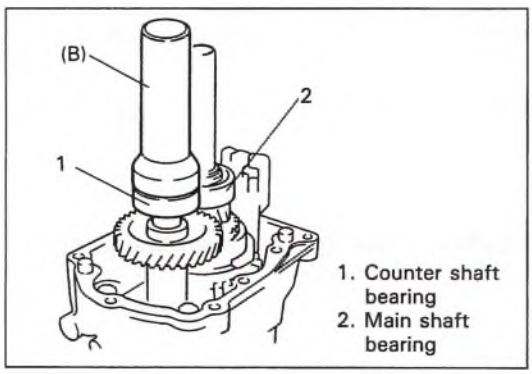
Tightening Torque for case bolts: 18—28 N·m (1.8—2.8 kg-m)

NOTE:
Be sure to install knock pin.



1. Counter shaft reverse gear
2. Spacer
3. Counter shaft 5th gear

11) Install counter shaft reverse gear, spacer and counter shaft 5th gear as shown in figure at the left.



1. Counter shaft bearing
2. Main shaft bearing

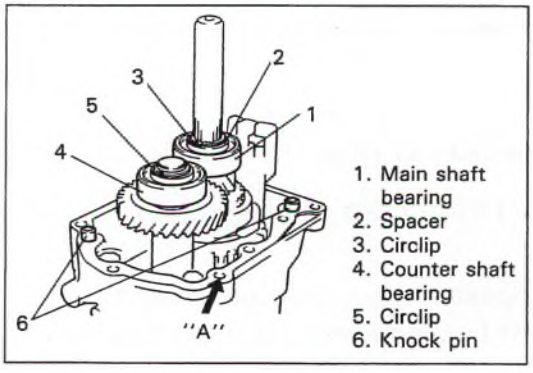
12) Install main shaft bearing by using special tool (A).

Special Tool
(A): 09913-80112

13) Install spacer to main shaft. And fix it by circlip.
14) Install counter shaft bearing by using special tool (B).

Special Tool
(B): 09951-76010

15) Install counter shaft side circlip by using snap ring pliers.



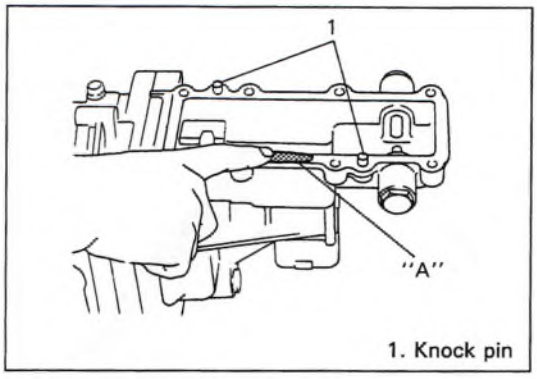
1. Main shaft bearing
2. Spacer
3. Circlip
4. Counter shaft bearing
5. Circlip
6. Knock pin

16) After cleaning mating surface of both cases, coat mating surface of extension case No.2 with sealant "A" evenly and put extension case No.1 and extension case No.2. And tighten case bolts (9 pcs.) to specified torque.

"A": Sealant 99000-31110

Tightening Torque for case bolts: 18—28 N·m (1.8—2.8 kg-m)

NOTE:
Be sure to install knock pin.



1. Knock pin

17) After cleaning mating surfaces of both cases. Coat mating surface of extension case No.1 with sealant "A" evenly and put gear shift lever case over extension case No.1. And tighten case bolts (8 pcs.) to specified torque.

"A": Sealant 99000-31110

Tightenint Torque for case bolts: 18—28 N·m (1.8—2.8 kg-m)

18) Install back-up light switch and release bearing.
After installation, check to ensure that input shaft turns smoothly and gear change can be achieved without fail.

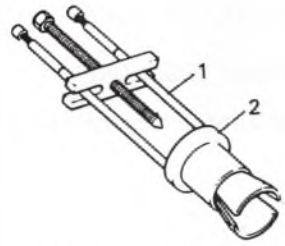
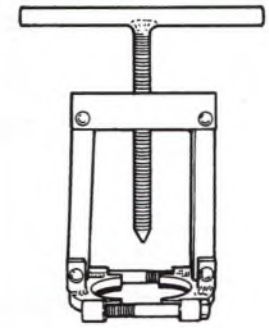
RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightenint torque	
	N·m	kg-m
Oil filler/level plug	20—30	2.0—3.0
Oil drain plug	20—30	2.0—3.0
Propeller shaft center bearing mounting bolt	41—61	4.1—6.1
Differential flange bolt	18—28	1.8—2.8
Control shaft joint nut	15—20	1.5—2.0
Shift control case bolts	20—25	2.0—2.5
Shift case mounting bracket No.1 bolt	20—25	2.0—2.5
Extension rod nut	40—60	4.0—6.0
Gear shift control shaft bolts and nuts	15—20	1.5—2.0
Transmission to engine bolts and nuts	51—61	5.1—6.1
Exhaust No.1 pipe to No.2 pipe nuts	41—61	4.1—6.1
Transmission case bolts	18—28	1.8—2.8

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCTS	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Oil seal lips • Gear shift locating ball • Gear shift shaft locating roller
Sealant	SUZUKI BOND NO.1215 (99000-31110)	• Oil drain plug • Gear shift shaft bolt • Mating surface of transmission case • Mating surface of extension case No.1 and No.2 • Mating surface of gear shift lever front case

SPECIAL TOOLS

 09900-06107 Snap ring pliers (Opening type)	 1. 09941-84520 Tensioner rod 2. 09941-84510 Bearing inner race remover	 09913-65810 Bearing puller	 09913-80112 Bearing installer
 09922-85811 Spring pin remover 4.5 mm	 09925-18010 Bearing installer	 09951-76010 Bearing installer	

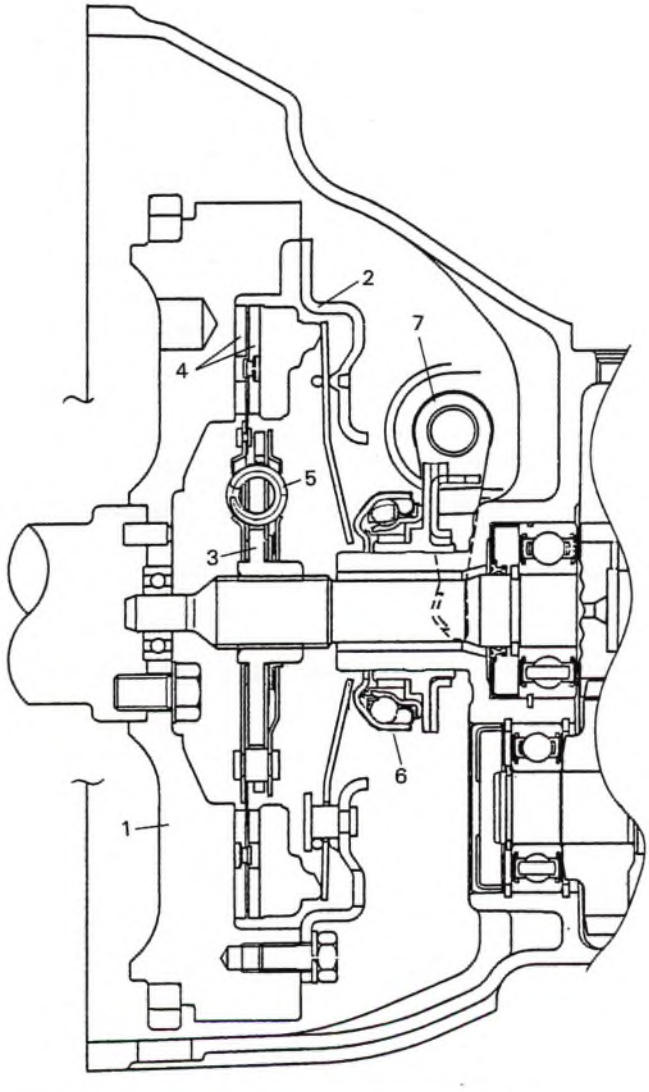
SECTION 7C

CLUTCH

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Release Shaft and Release Bearing ... 7C-7
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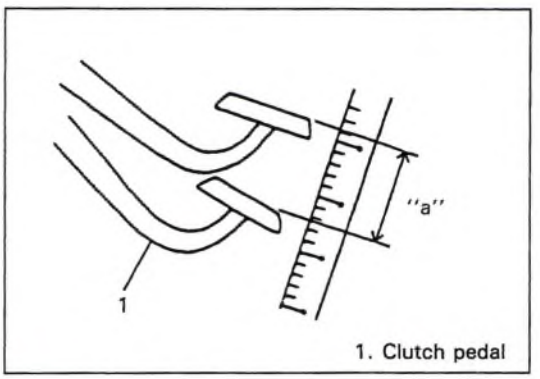
GENERAL DESCRIPTION



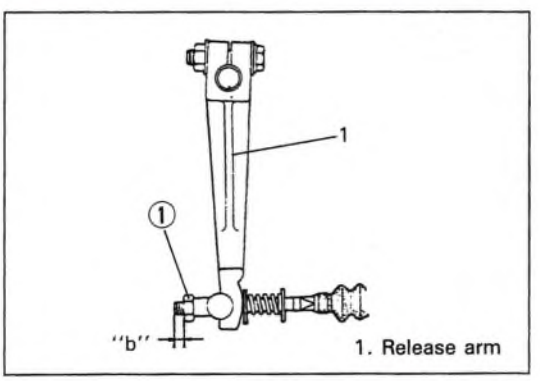
1. Flywheel
2. Cover assembly
3. Disc assembly
4. Lining
5. Torsion spring
6. Release bearing
7. Release arm

DIAGNOSIS

Condition	Possible Cause	Correction
Slipping	• Improper clutch pedal free travel.	Adjust free travel.
	• Worn or oily clutch disc facing.	Replace disc.
	• Warped disc, pressure plate or flywheel surface.	Replace disc, clutch cover or flywheel.
	• Weakened diaphragm spring.	Replace clutch cover.
	• Rusted clutch cable.	Replace cable.
Dragging clutch	• Improper clutch pedal free travel.	Adjust free travel.
	• Weakened diaphragm spring, or worn spring tip.	Replace clutch cover.
	• Rusted input shaft splines.	Lubricate.
	• Damaged or worn splines of transmission input shaft.	Replace input shaft.
	• Excessively wobbly clutch disc.	Replace disc.
	• Clutch facings broken or dirty with oil.	Replace disc.
Clutch vibration	• Glazed (glass-like) clutch facings.	Repair or replace disc.
	• Clutch facings dirty with oil.	Replace disc.
	• Release bearing slides unsmoothly on input shaft bearing retainer.	Lubricate or replace input shaft bearing retainer.
	• Wobbly clutch disc, or poor facing contact.	Replace disc.
	• Weakened torsion springs in clutch disc.	Replace disc.
	• Clutch disc rivets loose.	Replace disc.
	• Distorted pressure plate or flywheel surface.	Replace clutch cover or flywheel.
	• Weakened engine mounting or loosened mounting bolt or nut.	Retighten or replace mounting.
Noisy clutch	• Worn or broken release bearing.	Replace release bearing.
	• Input shaft front bearing worn down.	Replace input shaft bearing.
	• Excessive rattle of clutch disc hub.	Replace disc.
	• Cracked clutch disc.	Replace disc.
	• Pressure plate and diaphragm spring are rattling.	Replace clutch cover.
Grabbing clutch	• Clutch disc facings are soaked with oil.	Replace disc.
	• Clutch disc facings are excessively worn.	Replace disc.
	• Rivet heads are showing out of facing.	Replace disc.
	• Torsion springs are weakened.	Replace disc.



1. Clutch pedal



1. Release arm

ON-VEHICLE SERVICE

INSPECTION

CLUTCH PEDAL FREE TRAVEL

1) Depress clutch pedal, stop the moment clutch resistance is felt and measure distance (clutch pedal free travel). Free travel should be within following specification.

Clutch pedal free travel
"a": 20—30 mm

2) If free travel is out of specification, adjust it with joint nut ① .

Free travel of joint arm
"b": 2—4 mm

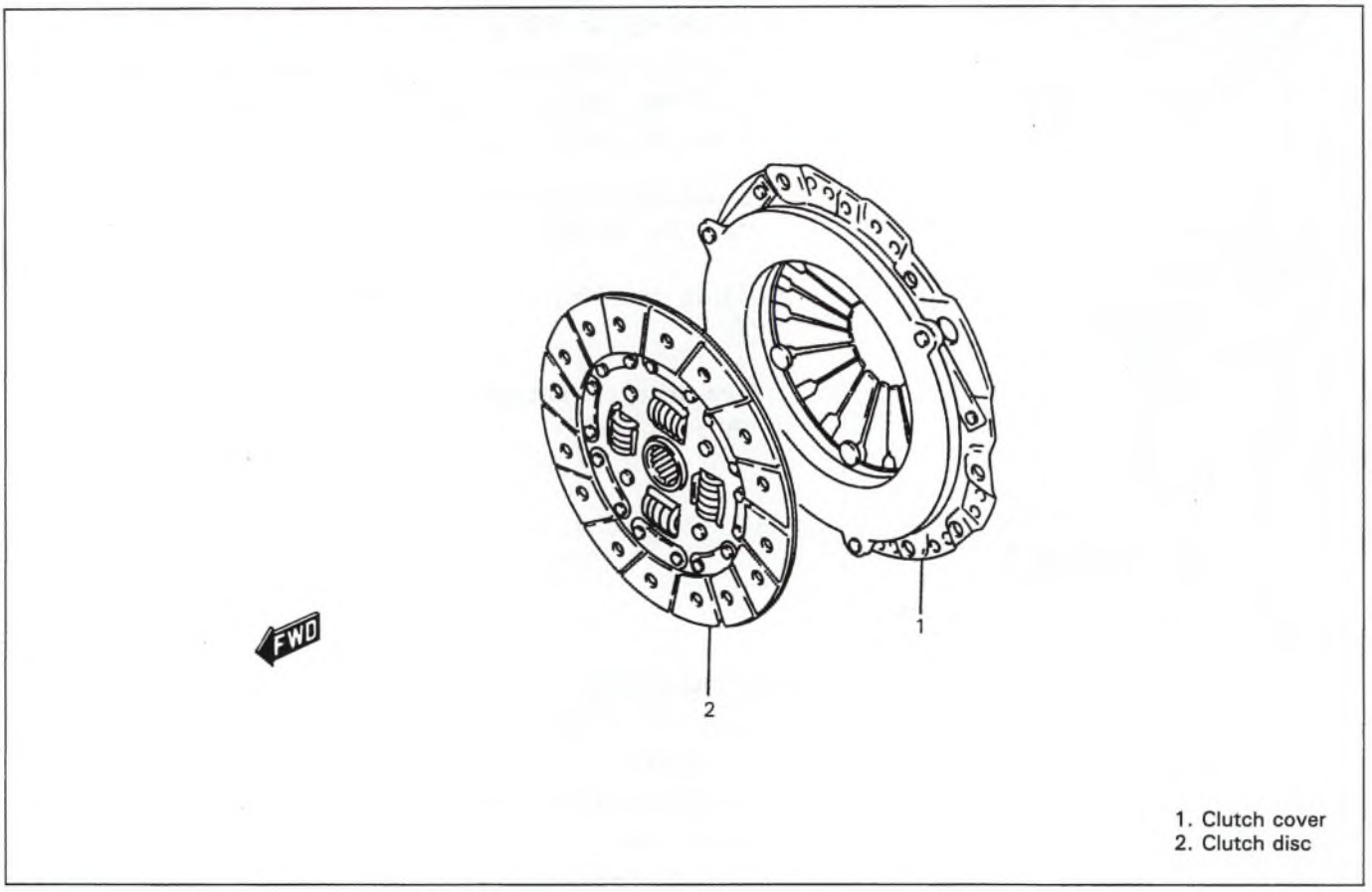
CLUTCH CABLE

Inspect clutch cable and replace it if any of following conditions exsists.

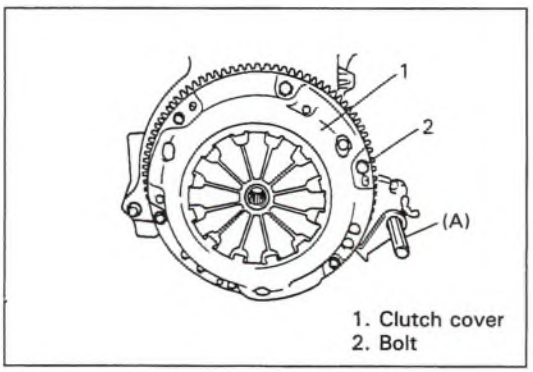
- Excessive cable friction.
- Frayed cable.
- Bent or kinked cable
- Broken boots.
- Worn end.

UNIT REPAIR OVERHAUL

CLUTCH COVER, CLUTCH DISC AND FLYWHEEL



1. Clutch cover
2. Clutch disc



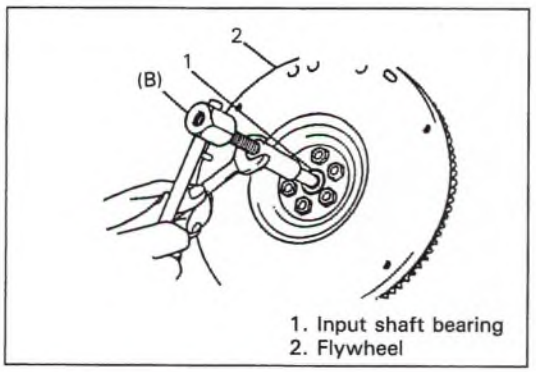
1. Clutch cover
2. Bolt

REMOVAL

For transmission removal procedure, refer to SECTION 7A.

1) Hold flywheel stationary with special tool (A) and remove clutch cover bolts (6 pcs.), clutch cover and clutch disc.

Special Tool
(A): 09924-17810

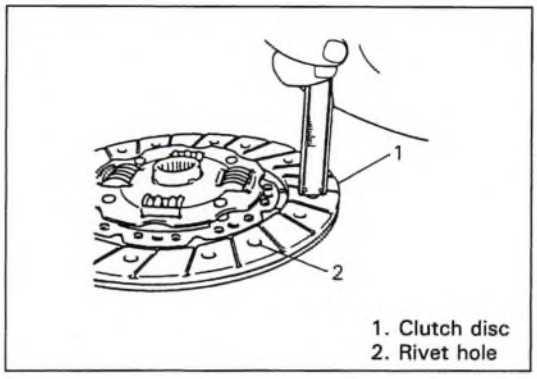


1. Input shaft bearing
2. Flywheel

2) Pull out input shaft bearing by using special tool (B) and wrench.

Special Tool
(B): 09917-58010

3) Remove flywheel by removing flywheel bolts (6 pcs.).



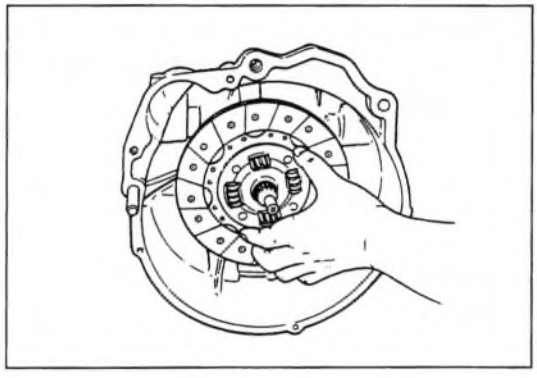
1. Clutch disc
2. Rivet hole

INSPECTION

Clutch Disc

Measure depth of rivet head depression, i.e. distance between rivet head and facing surface. If depression is found to have reached service limit at any of holes, replace disc assembly.

Revet head deph
Standard : 1.3 mm
Service limit: 0.1 mm



Play in Rotation Direction of Clutch Disc

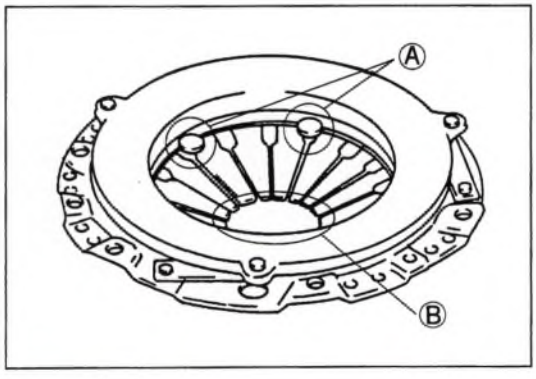
Insert clutch disc in serration part of input shaft and shake it in rotation direction to check for play.

Limit of play in
rotation direction: 1.0 mm (as measured at outer edge)

If measured play exceeds limit value, replace clutch disc, for excessive play will cause abnormal noise and vibration.

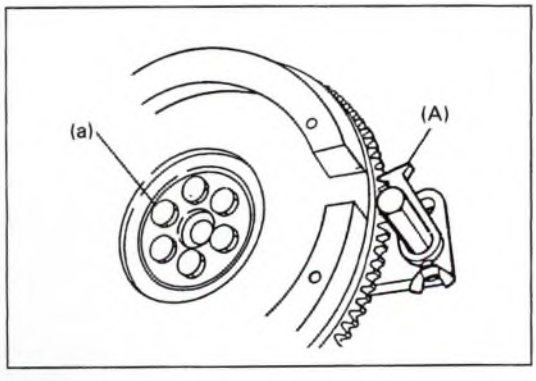
Input Shaft Bearing

Check bearing for smooth rotation and replace it if abnormality is found.



Clutch Cover

- Check caulked parts Ⓐ for looseness.
- Check contact part with release bearing Ⓑ for excessive wear.
 If abnormality is found, replace it as assembly. Do not disassemble it into diaphragm and pressure plate.

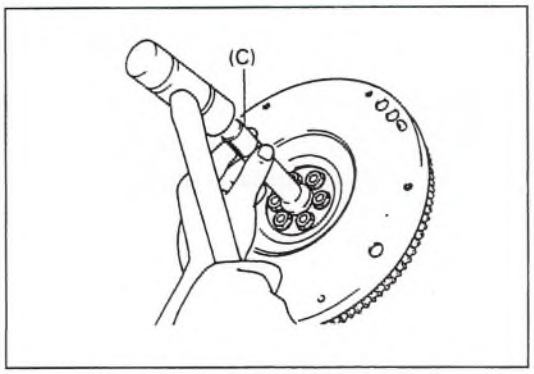


INSTALLATION

1) Install flywheel to crankshaft by using special tool (A) and tighten bolts to specified torque.

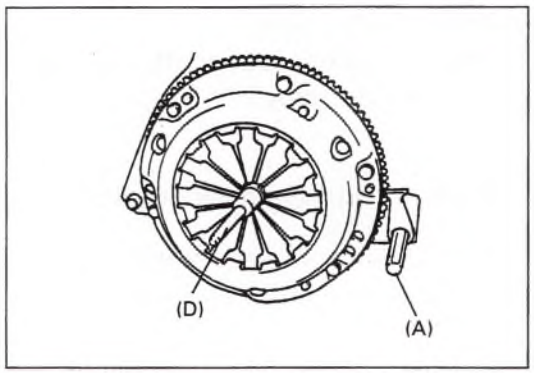
Tightening Torque
(a): 40—45 N·m (4.0—4.5 kg-m)

Special Tool
(A): 09924-17810



2) Install input shaft bearing to flywheel by using special tool (C).

Special Tool
(C): 09943-88211



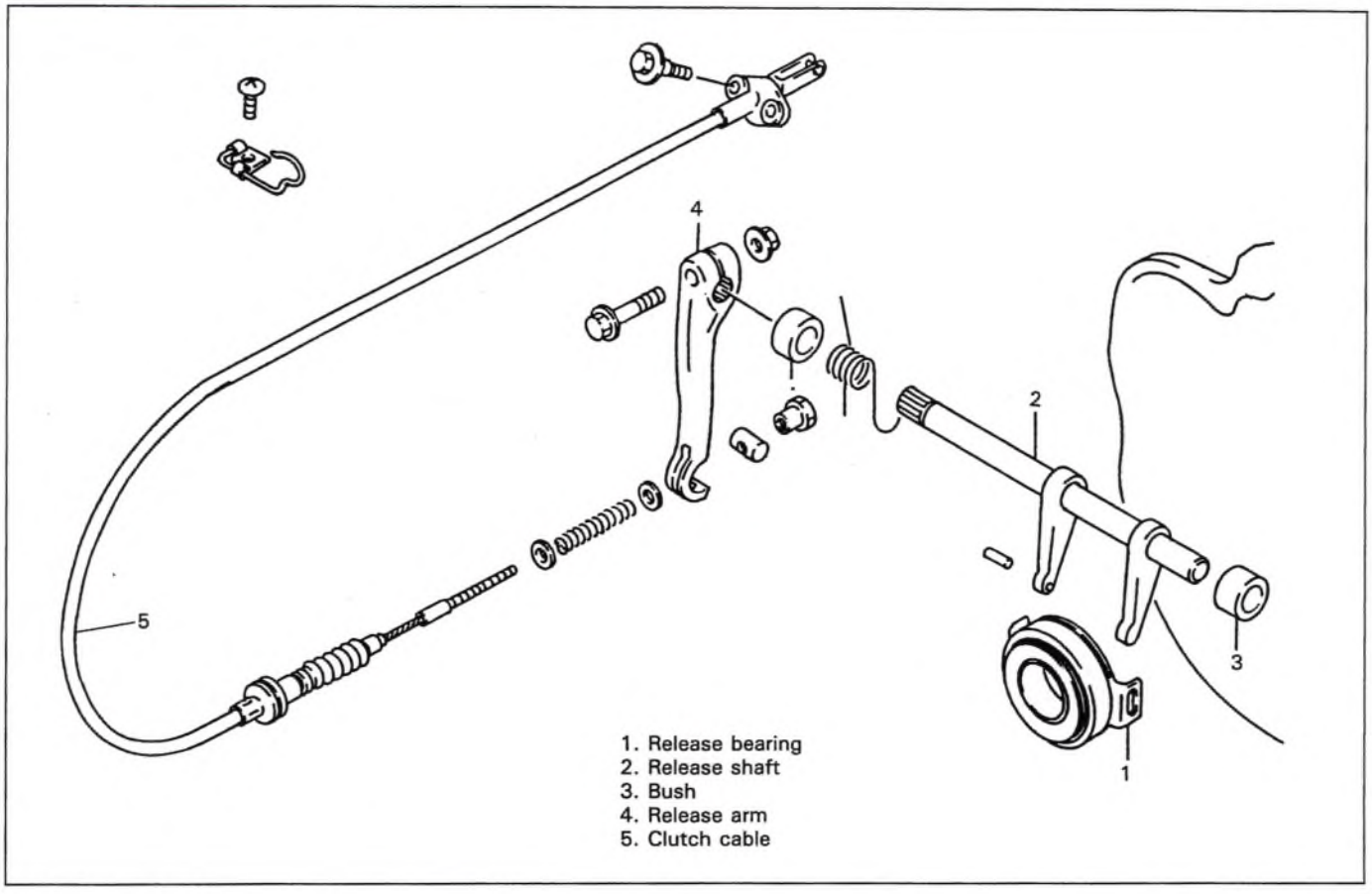
3) Install clutch disc to flywheel center by using special tools (A) and (D), install clutch cover and bolts. Then tighten bolts (6 pcs.) to specification.

Special Tools
(A): 09924-17810
(D): 09923-36330

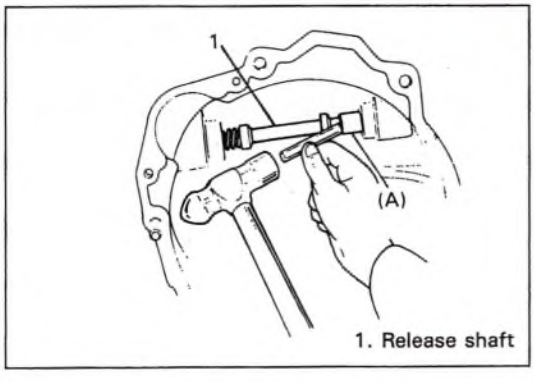
Tightening Torque for clutch cover bolts:
18—28 N·m (1.8—2.8 kg-m)

NOTE:
Before installation, be sure to degrease flywheel and pressure plate thoroughly and dry them.

RELEASE SHAFT AND RELEASE BEARING



1. Release bearing
2. Release shaft
3. Bush
4. Release arm
5. Clutch cable



1. Release shaft

REMOVAL

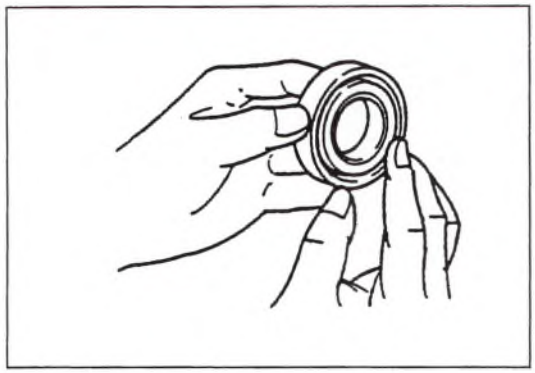
For transmission removal, refer to SECTION 7A.

1) Take out release bearing by turning release shaft.
2) Drive out release shaft No.2 bush by using special tool (A).

Special Tool
(A): 09925-48210

3) Slide release shaft to the right until opposite side end is disconnected from release shaft No.1 bush, then take out shaft from clutch housing.
4) Drive out release shaft No.1 bush by using special tool (A).

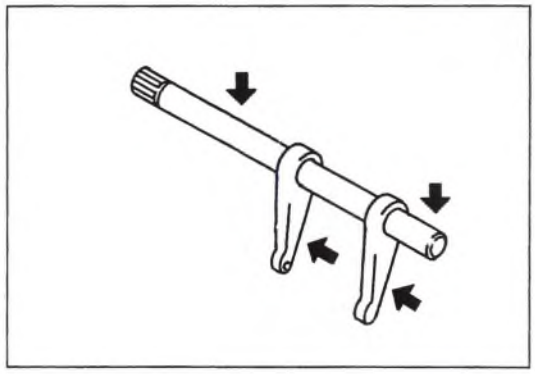
Special Tool
(A): 09925-48210



INSPECTION

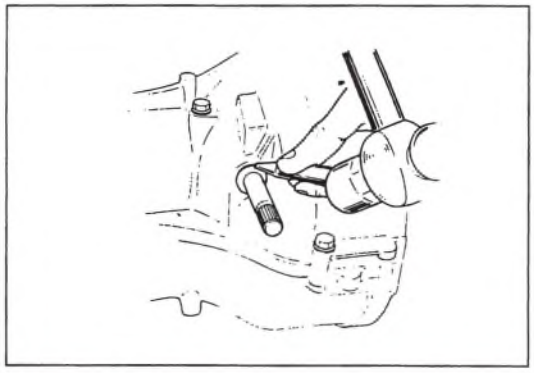
Release Bearing

Turn bearing by applying pressure in thrust direction by hand to check for abnormal resistance or being caught.
If abnormality exists, replace.



Clutch Release Shaft

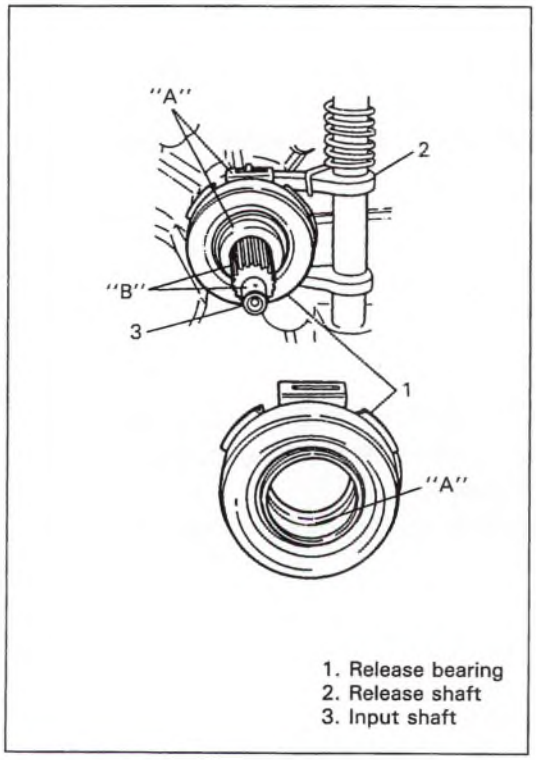
Check shaft for bend and damage.
Particularly check shaft bush for wear and damage.



INSTALLATION

Install in reverse order of removal procedure, noting the following points.

- To install bush No.2, drive it in with special tool and caulk it. Caulk case only.



1. Release bearing
2. Release shaft
3. Input shaft

- Before installation, apply grease "A" to inside of release bearing and release shaft arm.
- Apply grease "B" to tip end of input shaft and spline.

"A": Grease 99000-25010
"B": Grease 99000-25210

RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening Torque	
	N·m	kg-m
Flywheel bolts	40—45	4.0—4.5
Clutch cover bolts	18—28	1.8—2.8
Release arm bolt	10—16	1.0—1.6

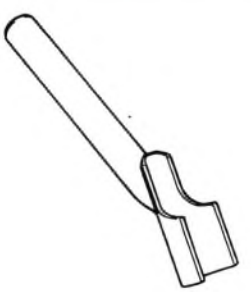
REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Cable end hook and joint pin. • Release shaft bushes and seal. • Release bearing inside and release shaft arm.
	SUZUKI SUPER GREASE I (99000-25210)	Input shaft spline and front end.

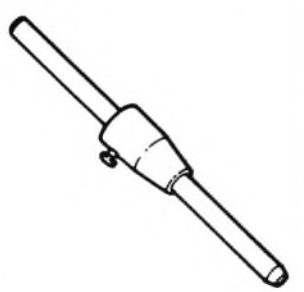
SPECIAL TOOLS



09917-58010
Bearing remover



09925-48210
Bush remover



09923-36330
Clutch center guide



09924-17810
Flywheel holder



09943-88211
Bearing installer

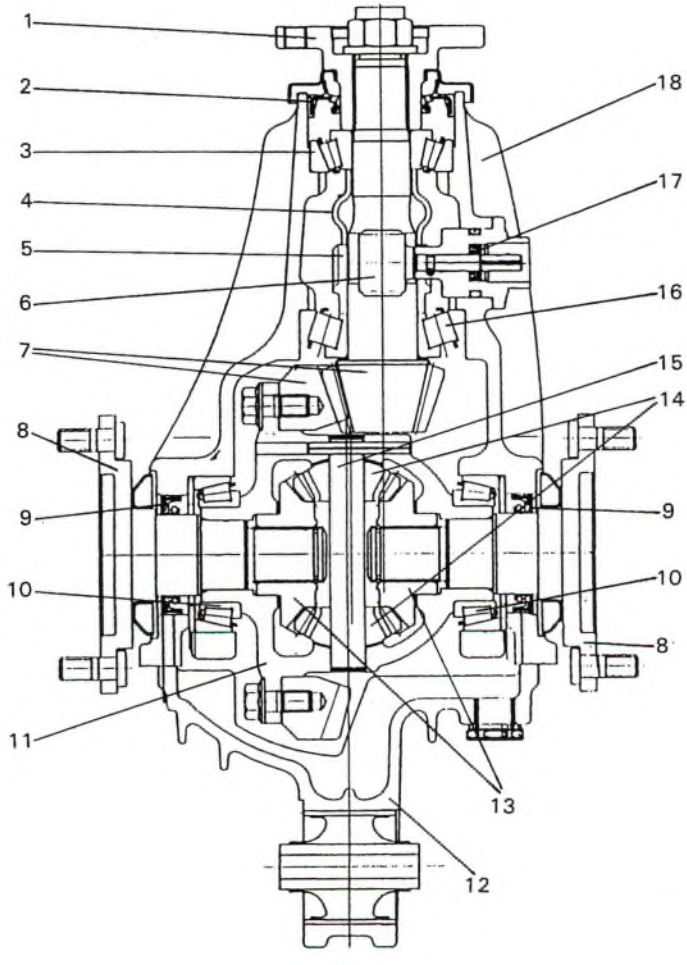
SECTION 7E

DIFFERENTIAL

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GENERAL DESCRIPTION



1. Differential flange
2. Input oil seal
3. Front bearing
4. Spacer
5. Speedometer drive gear
6. Speedometer driven gear
7. Drive bevel pinion gear set
8. Drive shaft flange
9. Differential side output oil seal
10. Differential side bearing
11. Differential sub-assembly
12. Differential cover
13. Differential side gear
14. Pinion gear
15. Pinion shaft
16. Rear bearing
17. Speedometer driven case
18. Differential carrier

DIAGNOSIS

Condition	Possible Cause	Correction
Gear noise	• Deteriorated or water mixed lubricant	Repair and replenish
	• Inadequate or insufficient lubricant	Repair and replenish
	• Maladjusted backlash between bevel pinion and gear	Adjust as prescribed
	• Improper tooth contact in the mesh between bevel pinion and gear	Adjust or replace
	• Loose bevel gear securing bolts	Replace or retighten
	• Damaged side gear(s) or side pinion(s)	Replace
Bearing noise	• (Constant noise) Deteriorated or water mixed lubricant	Repair and replenish
	• (Constant noise) Inadequate or insufficient lubricant	Repair and replenish
	• (Noise while coasting) Damaged bearing(s) of bevel pinion	Replace
	• (Noise while turning) Damaged diff. side bearing(s) or hub bearing(s)	Replace
Oil leakage	• Clogged breather plug	Clean
	• Worn or damaged oil seal	Replace
	• Excessive oil	Adjust oil level
	• Loose differential cover bolts	Replace or retighten

ON-VEHICLE SERVICE

CHANGING OIL

1) Before oil change or oil level inspection, stop engine and hoist vehicle.
2) Drain oil.
3) Apply sealant to thread of drain plug and torque plug to specification.

Tightening Torque
(a): 20—30 N·m (2.0—3.0 kg-m)

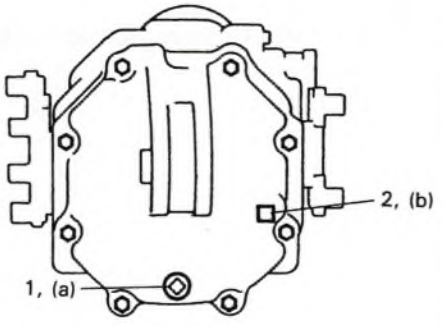
"A": Sealant 99000-31110

4) Pour proper amount of gear oil as specified below (roughly up to level hole).
5) Install new gasket to oil level plug and torque plug to specification.

Tightening Torque
(b): 18—28 N·m (1.8—2.8 kg-m)

Oil specification: Hypoid gear oil API GL-5 SAE 80W-90

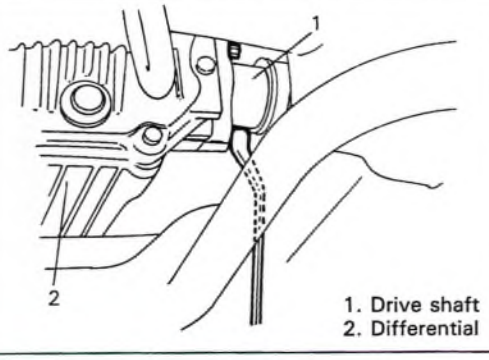
Oil capacity: 0.8 L



1. Drain plug
2. Oil level plug

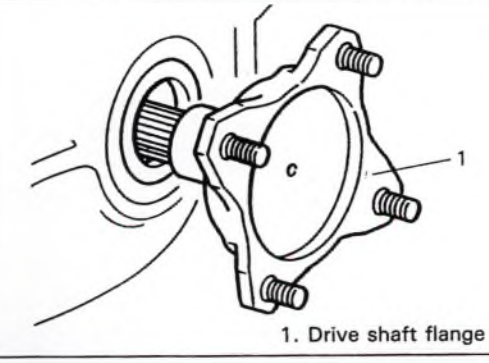
CHANGING DIFFERENTIAL SIDE OIL SEAL

1) Remove drive shaft from differential. (Refer to SECTION 4C.)

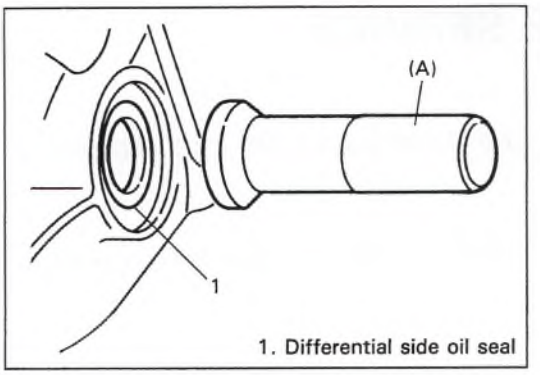


1. Drive shaft
2. Differential

2) Remove drive shaft flange from differential.



1. Drive shaft flange



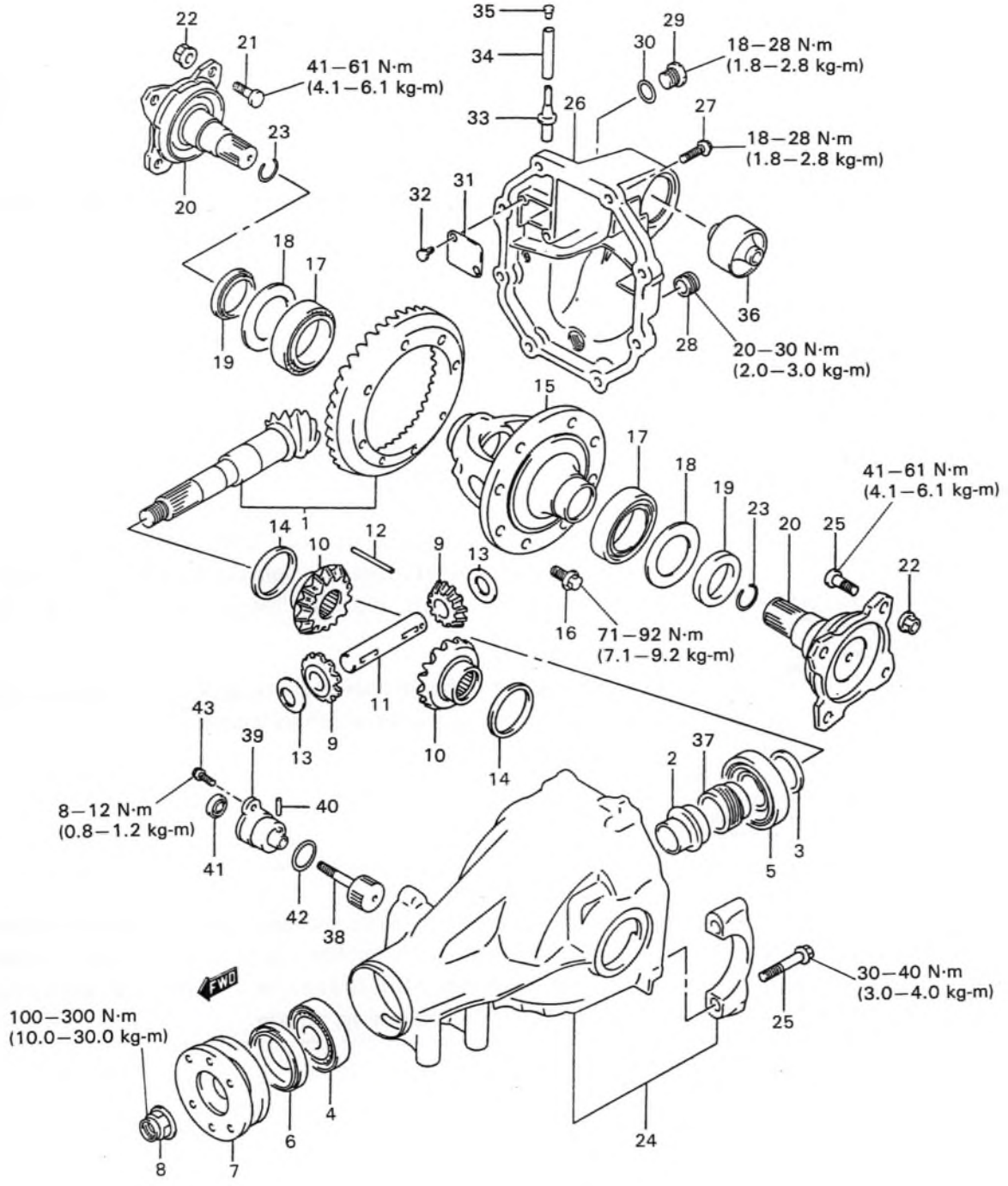
1. Differential side oil seal

3) Remove differential side oil seal. And then install new oil seal by using special tool (A).

Special Tool
(A): 09913-75810

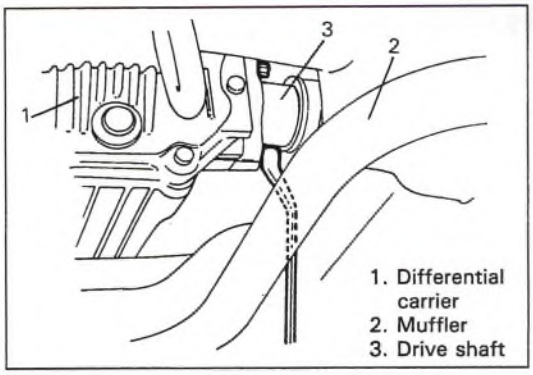
4) Install drive shaft flange.
5) Install drive shaft and torque nuts to specification. (Refer to SECTION 4C.)

UNIT REPAIR OVERHAUL



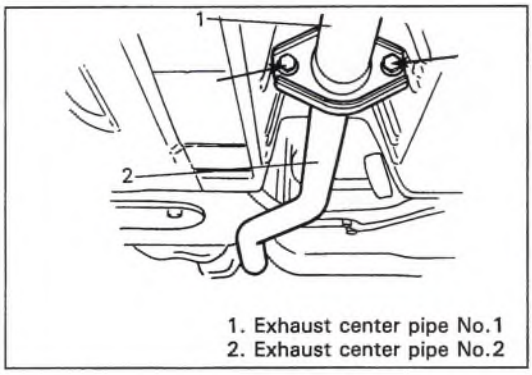
1. Drive pinion gear set
2. Pinion bearing spacer
3. Bevel pinion shim
4. Front bearing
5. Rear bearing
6. Diff. input oil seal
7. Universal joint flange
8. Drive pinion nut
9. Differential pinion
10. Differential side gear
11. Pinion shaft
12. Spring pin
13. Washer
14. Washer
15. Differential case
16. Bolt
17. Differential side bearing
18. Differential side shim
19. Differential side oil seal
20. Drive shaft flange
21. Bolt
22. Nut
23. Circlip
24. Differential carrier ass'y
25. Bolt
26. Differential cover
27. Bolt
28. Oil drain plug
29. Oil filler plug
30. Gasket
31. Oil protect plate
32. Bolt
33. Breather union
34. Hose
35. Breather plug
36. Differential rear mount
37. Speedometer drive gear
38. Speedometer driven gear
39. Speedometer driven gear case
40. Spring pin
41. Oil seal
42. O-ring
43. Bolt

DISMOUNTING



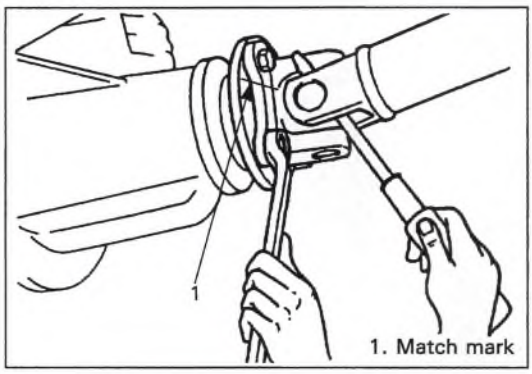
1. Differential carrier
2. Muffler
3. Drive shaft

1) Hoist vehicle and remove drive shaft from differential. (Refer to SECTION 4C.)



1. Exhaust center pipe No.1
2. Exhaust center pipe No.2

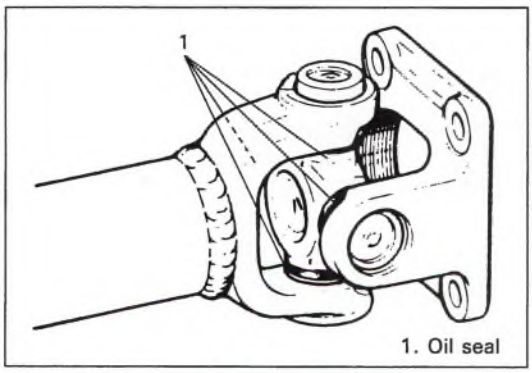
2) Remove exhaust center pipe No.2 and muffler. (Refer to SECTION 6K.)



1. Match mark

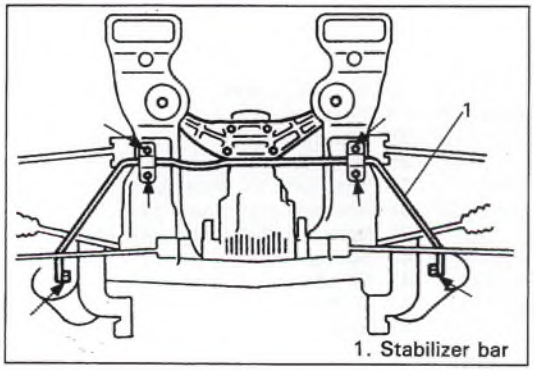
3) Remove propeller shaft from differential.
Lock propeller shaft with a proper size rod or the like as shown at the left and then loosen propeller shaft bolts.

NOTE:
Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown.



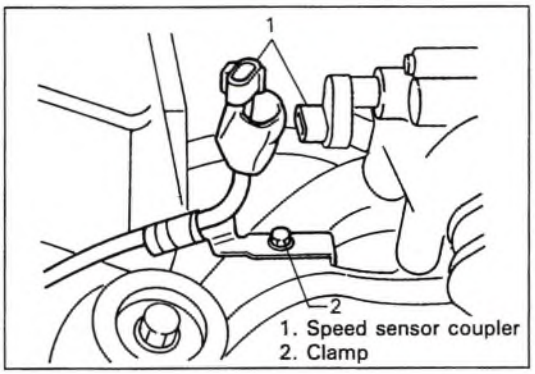
1. Oil seal

CAUTION:
When inserting a proper size rod or the like into cross joint to secure propeller shaft, use care not to break seal used for joint. Broken seal will cause joint to run out of oil or function poorly.



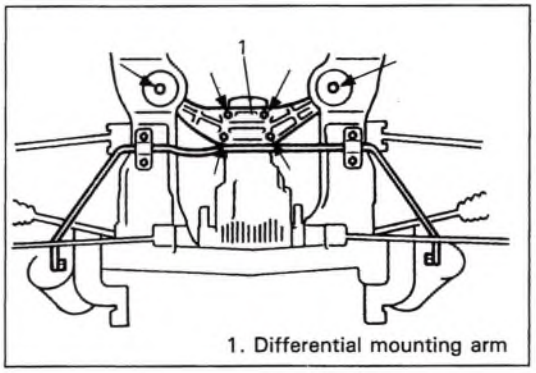
1. Stabilizer bar

4) Remove stabilizer bar.



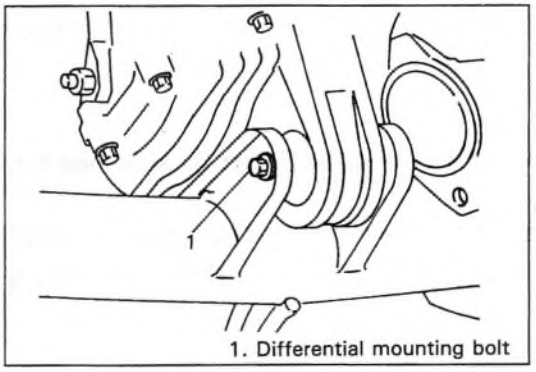
1. Speed sensor coupler
2. Clamp

5) Remove speed sensor lead wire at speed sensor coupler.
6) Remove speed sensor lead wire clamp from differential mounting bracket.



1. Differential mounting arm

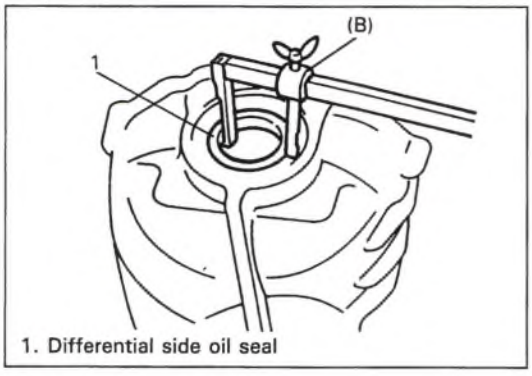
7) Remove differential mounting arm.



1. Differential mounting bolt

8) Remove differential mounting bolt.

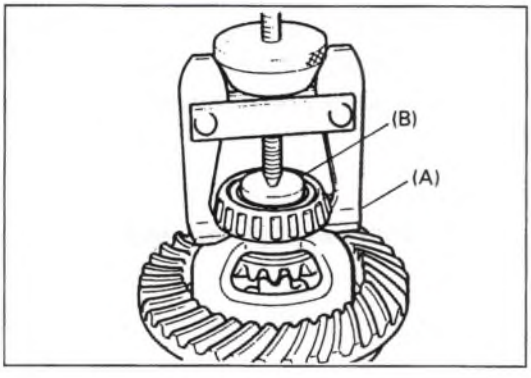
9) Remove differential assembly.



1. Differential side oil seal

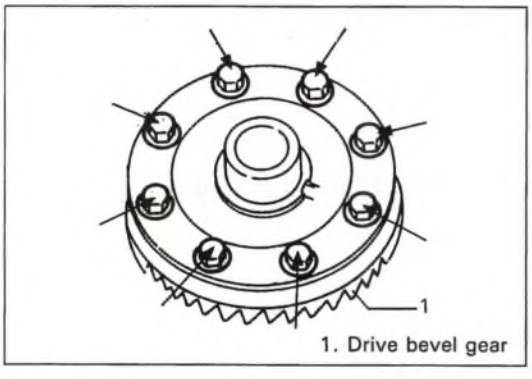
12) Remove differential side oil seal using special tool (B).

Special Tool
(B): 09913-50121



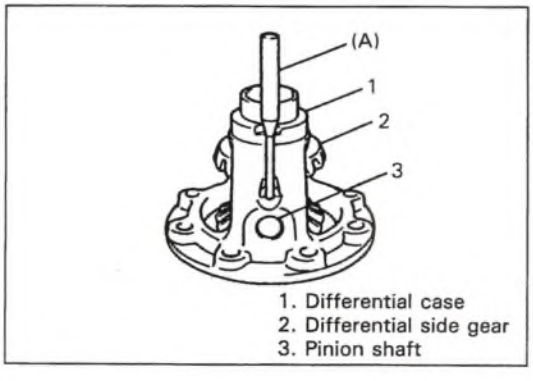
13) Using special tools (A) and (B), pull out differential side bearings.

Special Tool
(A): 09913-61510
(B): 09913-85230



1. Drive bevel gear

14) Remove drive bevel gear.



1. Differential case
2. Differential side gear
3. Pinion shaft

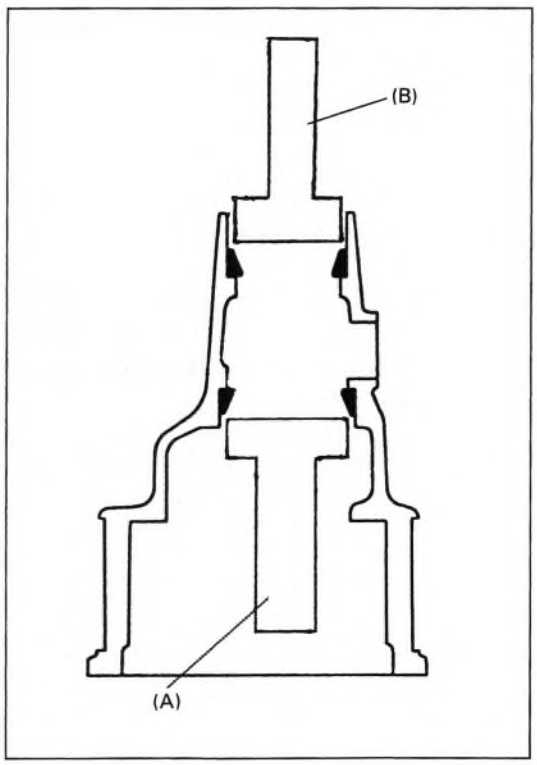
15) Drive out spring pin with special tool and hammer and remove pinion shaft.

Special Tool
(A): 09922-85811

ASSEMBLY

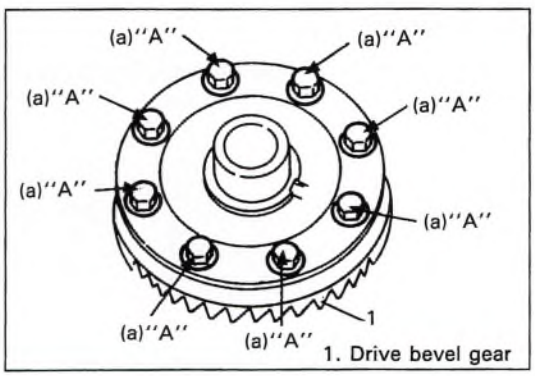
Assemble in reverse order of disassembly procedure noting the following points.

- Before assembly, check each part for wear, damage, etc. and if any faulty condition is found, replace.
- Be sure to wash all parts.



- For press-fitting bevel pinion bearing outer races, use special tools as shown.

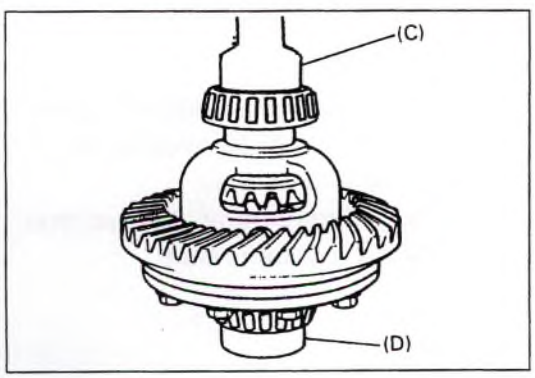
Special Tool
(A): 09913-75510
(B): 09913-75520



1. Drive bevel gear

- Put bevel gear on differential case and fasten them with bolts by tightening them to specified torque. Use thread lock cement for bolts.

Tightening torque
(a): 71—92 N·m (7.1—9.2 kg-m)
"A": Thread lock cement 99000-32030

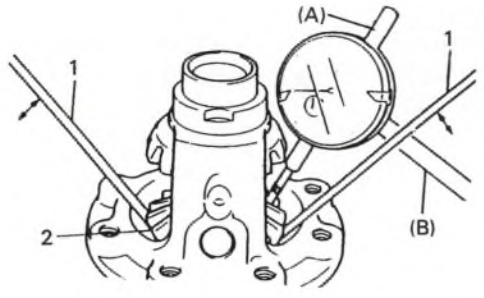


- Press-fit side bearings with special tools (C) and (D) and press.

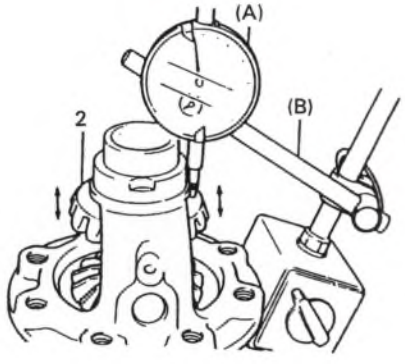
> **CAUTION:**
> **Be sure to use special tool (D) for the purpose of protecting lower bearing.**

Special Tool
(C): 09913-75810
(D): 09913-85230

Left side



Right side



1. Slotted screwdriver
2. Differential gear

ADJUSTMENT

DIFFERENTIAL SIDE GEAR PLAY IN THRUST DIRECTION

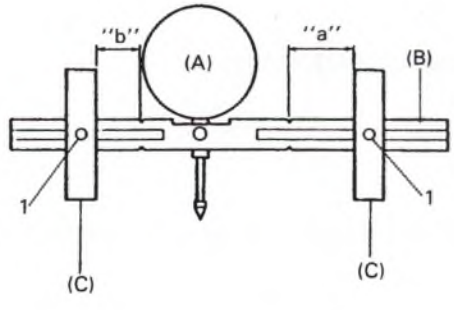
1) • Left Side
 Apply pointed end of dial gauge to gear thread as shown at the left.
 While moving gear up and down with two large slotted screwdrivers, read dial gauge.
 • Right Side
 Apply pointed end of dial gauge to gear shoulder as shown at the left.
 While moving gear up and down with fingers, read dial gauge.

 Special Tool
 (A): 09900-20606
 (B): 09900-20701

 Play in thrust direction: 0.00—0.21 mm

2) If measured play in thrust direction is not within specified range, insert thrust washer of suitable thickness from among available ones listed below. Measure play again to make sure it is within specification.

 Available thrust washer thickness: 0.9, 0.95, 1.0, 1.05, 1.1, 1.15, 1.2 mm



1. Bolt

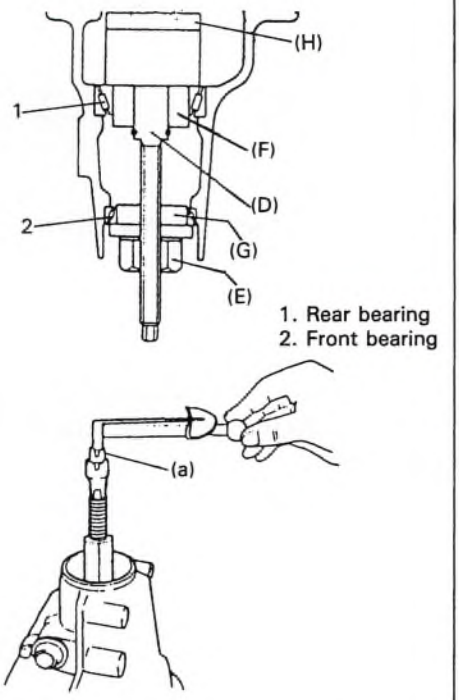
BEVEL PINION SHIM ADJUSTMENT

1) Set special tools as shown in figure and make 0 (zero) adjustment on surface plate.

 Dimension
 "a": 17.0 mm
 "b": 7.5 mm

 Special Tool
 (A): 09900-20606, Dial gauge
 (B): 09922-76120, Bevel pinion mounting dummy shaft
 (C): 09922-76220, (2 pcs.), Bevel pinion bearing dummy

 NOTE:
 - **When setting dial gauge to mounting dummy shaft, tighten screw lightly. Be careful not to overtighten it, which will cause damage to dial gauge.**
 - **Set bearing dummy to mounting dummy shaft so that flat part of mounting dummy contacts bolt.**



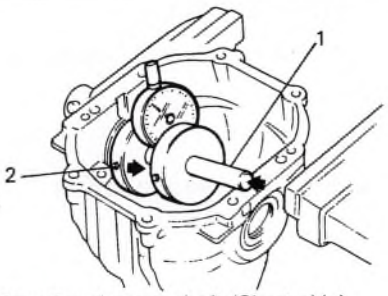
1. Rear bearing
2. Front bearing

2) Install special tools with bearings into differential carrier and tighten special tool nut so that specified bearing preload is obtained.

Special Tool
(D): 09922-76140, Bevel pinion shaft
(E) : 09922-76150, Bevel pinion nut
(F) : 09922-76420, Bevel pinion front collar
(G): 09922-76340, Bevel pinion rear collar
(H): 09922-76540, Bevel pinion gauge block

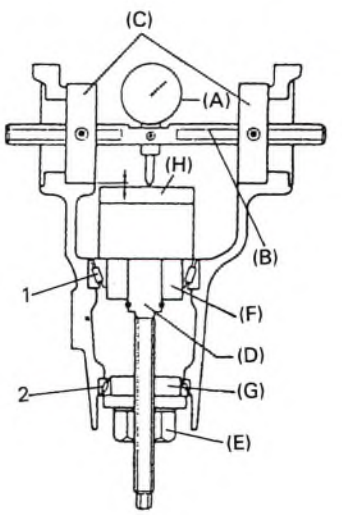
NOTE:
This installation requires no spacer or oil seal.

Pinion bearing preload
(a): 0.5—1.3 N·m (5—13 kg-cm)



1. Mounting dummy shaft (Short side)
2. Bearing dummy bolt (Loosen)

3) Move bearing dummy to the center by loosening attaching bolt of bearing dummy which is installed to longer side of mounting dummy shaft of zero-adjusted special tools. Then, after installing zero-adjusted special tools to differential case as shown in figure, move back bearing dummy to its position as shown in Step 1) and tighten attaching bolt again.



1. Rear bearing
2. Front bearing

4) Place dial gauge set on pinion dummy and take measurement between zero position and extended dial gauge measuring tip.

NOTE:
- **Repeat turning back and force of dummy and measure distance as far as top surface of pinion dummy accurately.**
- **When dial gauge measuring tip extends from 0 (zero) position, pointer turns counterclockwise.**
- **Measured value may exceed 1 mm. Therefore, it is also necessary to know reading of short pointer.**

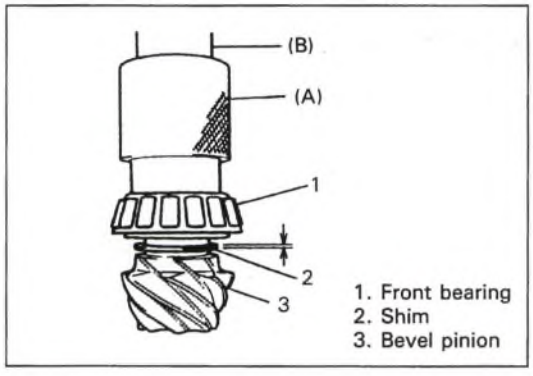
Special Tool

(A): 09900-20606	**(E) : 09922-76150**
(B): 09922-76120	**(F) : 09922-76420**
(C): 09922-76220	**(G): 09922-76340**
(D): 09922-76140	**(H): 09922-76540**

5) Obtain adjusting shim thickness by using measured value by dial gauge in following equation.

Necessary shim thickness	= 85 +	Dial gauge measured value	–	Measurement printed on pinion shaft

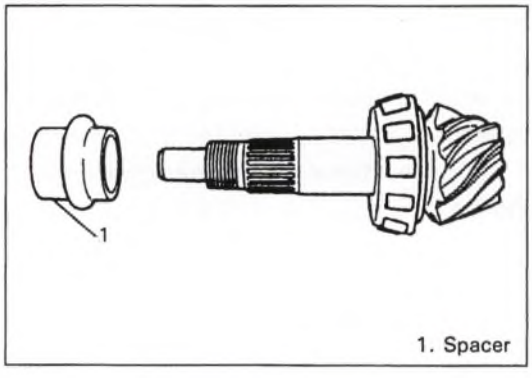
85 in above equation is mounting dummy size.



1. Front bearing
2. Shim
3. Bevel pinion

6) Select adjusting shim(s) closest to calculated value from among following available sizes and put it in place and then press-fit rear bearing.

Special Tool
(A): 09940-53111
(B): 09925-18010

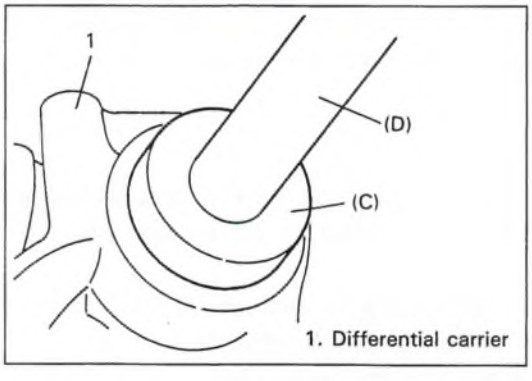


1. Spacer

PINION BEARING PRELOAD ADJUSTMENT

1) With new pinion spacer inserted as shown, install front bearing to differential carrier.

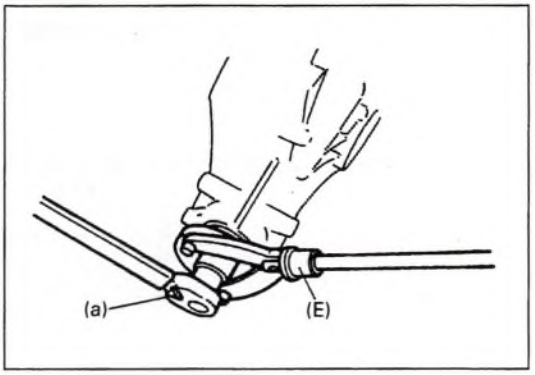
NOTE:
- **Make sure to use new specer for reinstallation.**
- **Apply oil to bearings.**



1. Differential carrier

2) Using special tool and plastic hammer, drive oil seal into differential carrier till it becomes flush with carrier end. Then apply grease to oil seal lip.

Special Tool
(C): 09944-88210
(D): 09924-74510



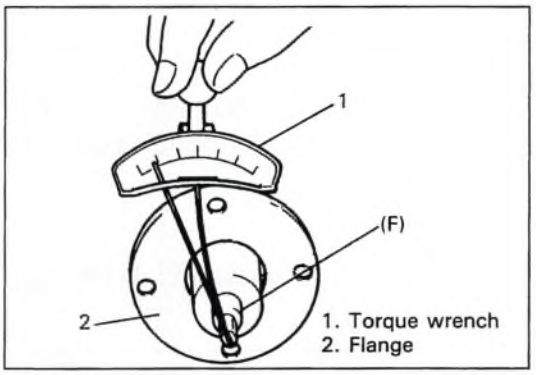
3) While tightening flange nut gradually with flange holder (special tool) and wrench, set preload of pinion to specification.

NOTE:

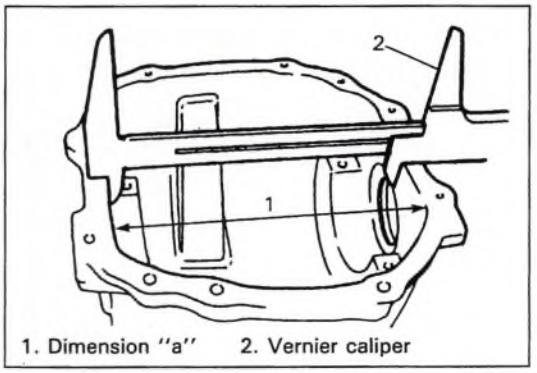
- **Before taking preload measurement, check for smooth rotation by hand.**
- **Be sure to tighten gradually and carefully till specified preload is obtained. Turning back overtightened flange nuts should be avoided.**

Pinion bearing preload: 5.0—13.0 kg-cm

Special Tool
(E): 09930-40113
(F): 09915-24550



1. Torque wrench
2. Flange

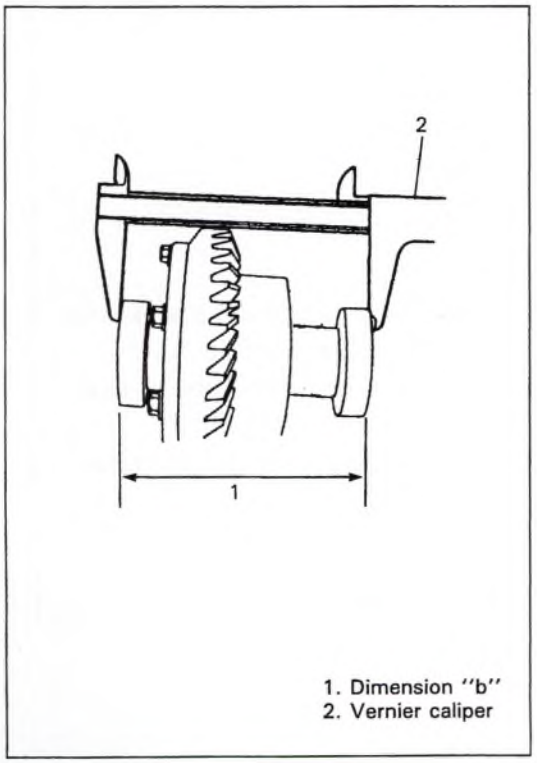


1. Dimension "a"
2. Vernier caliper

DRIVE BEVEL GEAR BACKLASH AND SIDE BEARING PRELOAD

Adjustment

1) Measure dimension "a" by using vernier caliper.



1. Dimension "b"
2. Vernier caliper

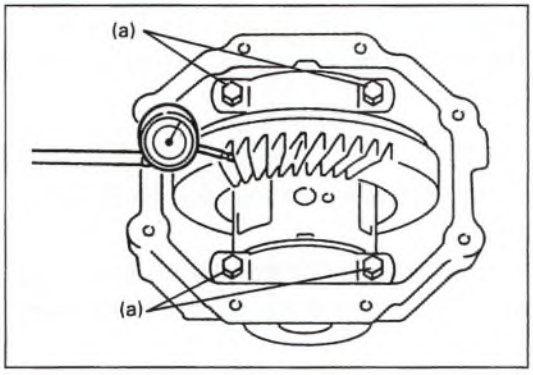
2) Measure dimension "b" by using vernier caliper.

NOTE:
Take measurement with outer race of taper roller bearings on both sides pressed against roller hard.

3) Caulculate total thickness of differential side shims to be inserted at both sides as follows.

Total thickness of differential side shims at both sides = (a—b) + d (mm)
"a": Differential case dimension
"b": Differential gear assembly dimension
"d": 0.03—0.06

Shim thickness (mm): 2.72, 2.69, 2.66, 2.63, 2.60, 2.57, 2.54, 2.51, 2.48, 2.45, 2.42, 2.39, 2.36, 2.33, 2.30



4) Based on above calculation, allot shims to both sides while measuring backlash.

NOTE:
Take backlash measurement with bearing cap installed.

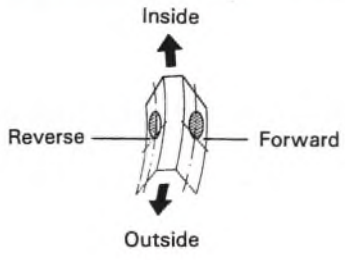
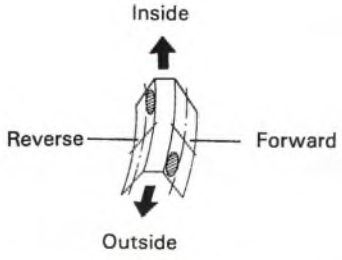
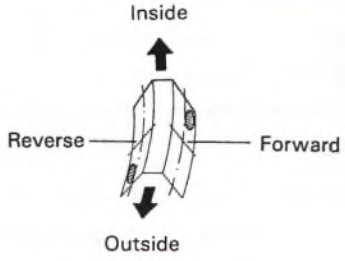
Drive bevel gear backlash = 0.1—0.2 mm

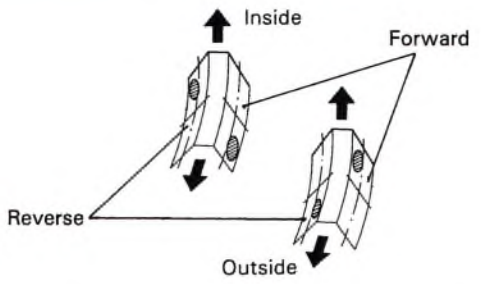
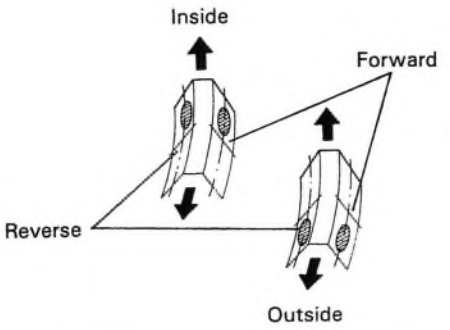
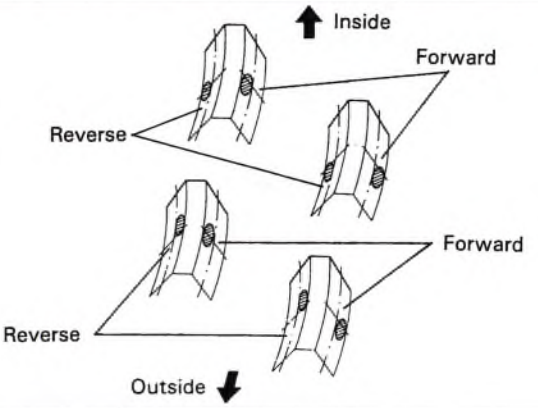
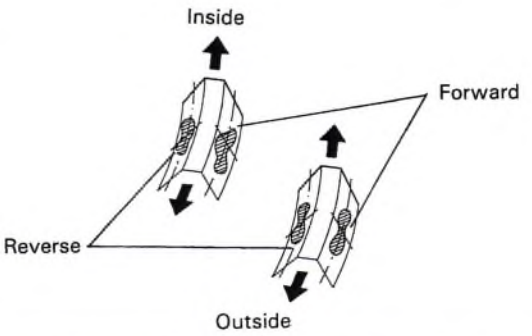
Tightening Torque
(a): 30—40 N·m (3.0—4.0 kg-m)

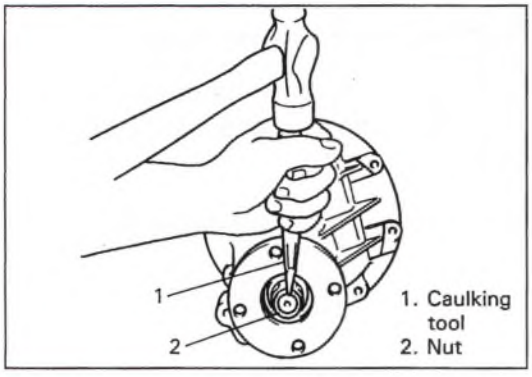
INSPECTION OF GEAR TOOTH SURFACE CONTACT

Upon completion of assembly, apply a thin, uniform coat of red lead paste (marking compound) to both surfaces of drive bevel gear teeth (3 teeth at three different positions.) and turn it by hand to check its contact with drive bevel pinion. Adjust if check result is not satisfactory.

NOTE:
If bevel gear is rotated more than one full rotation, tooth contact pattern will become unclear and difficult to check.

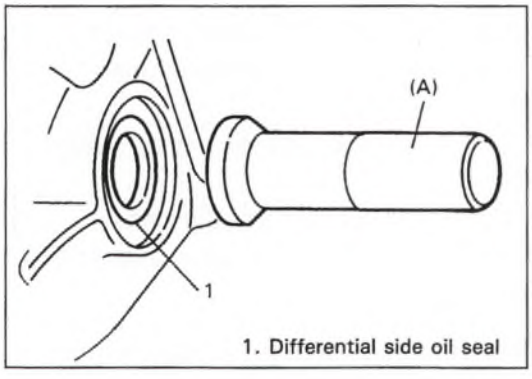
	Tooth surface contact	Possible cause and correction
Correct		Both forward and reverse contacts should occur a little toward inside from the center.
Poor shim adjustment		Forward contact occurs toward outside and reverse contact toward inside from the center and both at higher position. In such case, bevel pinion shim is too thin. Correction: Adjust thim thickness by increasing it.
		Forward contact occurs toward inside and reverse contact toward outside from the center and both at lower position. In such case, bevel pinion shim is too thick. Correction: Adjust shim thickness by reducing it.

	Tooth surface contact	Possible cause and correction
Defect in part(s)		When tooth contacts occur as sown at the left, proper differential carrier offset (23 mm) is not obtained. Correction: Replace differential carrier.
		When tooth contacts are deviated toward inside or outside of gear, possible causes are as follows. • Drive bevel gear or drive bevel pinion defective. • Poor squareness of differential carrier. • Differential carrier surface where gear is installed is defective. Correction: Replace defective part as an assembly.
		When tooth contacts occur as shown at the left, gear itself is defective. Correction: Replace drive bevel gear and drive bevel pinion as a set.
		When contact is not oval in shape, gear itself is defective. Abnormal contact is also caused by nick in tooth surface or faulty condition transmission case at its drive bevel gear mounting part. Correction: Replace drive bevel gear and drive bevel pinion as a set and differential gear case as well, if found defective.



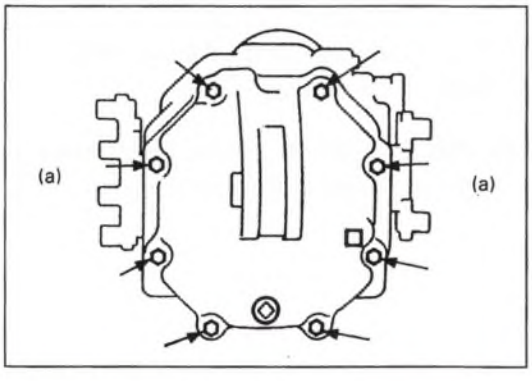
REMOUNTING

- Remount in reverse order of dismounting procedure, noting following points.
- Upon completion of gear tooth contact check, caulk flange nut with caulking tool and hammer.



- Using special tool, install differential side bearing oil seal.

Special Tool
(A): 09913-75810



- Clean mating surfaces of both cover and carrier and apply sealant to carrier side evenly.

"A": Sealant 99000-31110

Tightening Torque
(a): 21—31 N·m (2.1—3.1 kg-m)

Tighten each bolt and nut to specified torque. (Refer to 7E-5.)

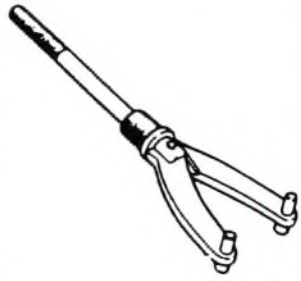
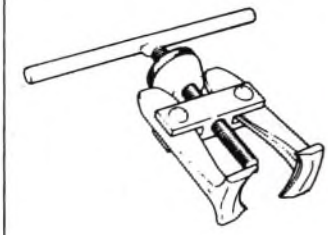
RECOMMENDED TORQUE SPECIFICATIONS

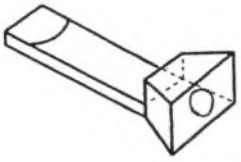
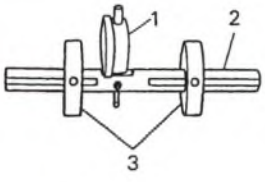
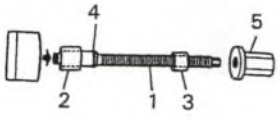
Fastening portion	Tightening torque	
	N·m	kg-m
Differential drain plug	20—30	2.0—3.0
Differential oil level plug	18—28	1.8—2.8
Drive shaft flange bolt	41—61	4.1—6.1
Differential cover bolt	18—28	1.8—2.8
Drive bevel gear bolt	71—92	7.1—9.2
Differential side bearing cap	30—40	3.0—4.0
Speed sensor bolt	8—12	0.8—1.2
Drive pinion nut	100—300	10.0—30.0

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCTS	USE
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Oil drain plug • Mating surface of differential carrier
Thread lock cement	SUZUKI BOND 1303B (99000-32030)	• Bevel gear bolt

SPECIAL TOOLS

			
09913-75810 Bearing installer	09930-40113 Rotor holder	09913-50121 Oil seal remover	09913-61510 Bearing puller

 09913-85230 Bearing puller attachment	 09922-85811 Spring pin remover	 09913-75510 Bearing installer (Diameter: 70.5 mm)	 09913-75520 Bearing installer (Diameter: 60.5 mm)
 09921-96010 Sliding hammer	 09921-96020 Sliding hammer attachment	 09900-20606 Dial gauge	 09900-20701 Magnetic stand
 1. Dial gauge 2. 09922-76120 Bevel pinion mounting dummy shaft 3. 09922-76220 Bevel pinion bearing dummy	 1. 09922-76140 Bevel pinion shaft 2. 09922-76420 Bevel pinion front collar 3. 09922-76340 Bevel pinion rear collar 4. O-ring 5. 09922-76150 Bevel pinion nut	 09915-24550 Adapter socket	 09940-53111 Bearing installer
 09925-18010 Remover handle	 09944-88210 Bearing installer	 09924-74510 Bearing installer handle	

SECTION 8

BODY ELECTRICAL SYSTEM

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BODY ELECTRICAL SYSTEM 8- 2
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WIRING DIAGRAM Wiring diagrams are attached at the end of this manual.

8

NOTE:

- **Number in [] in circuit diagram indicates harness No. Also, Ⓓ stands for "directly attached ground".**
- **For information on alphabet indicated on ground wire in circuit, refer to p. 8-38.**

GENERAL DESCRIPTION

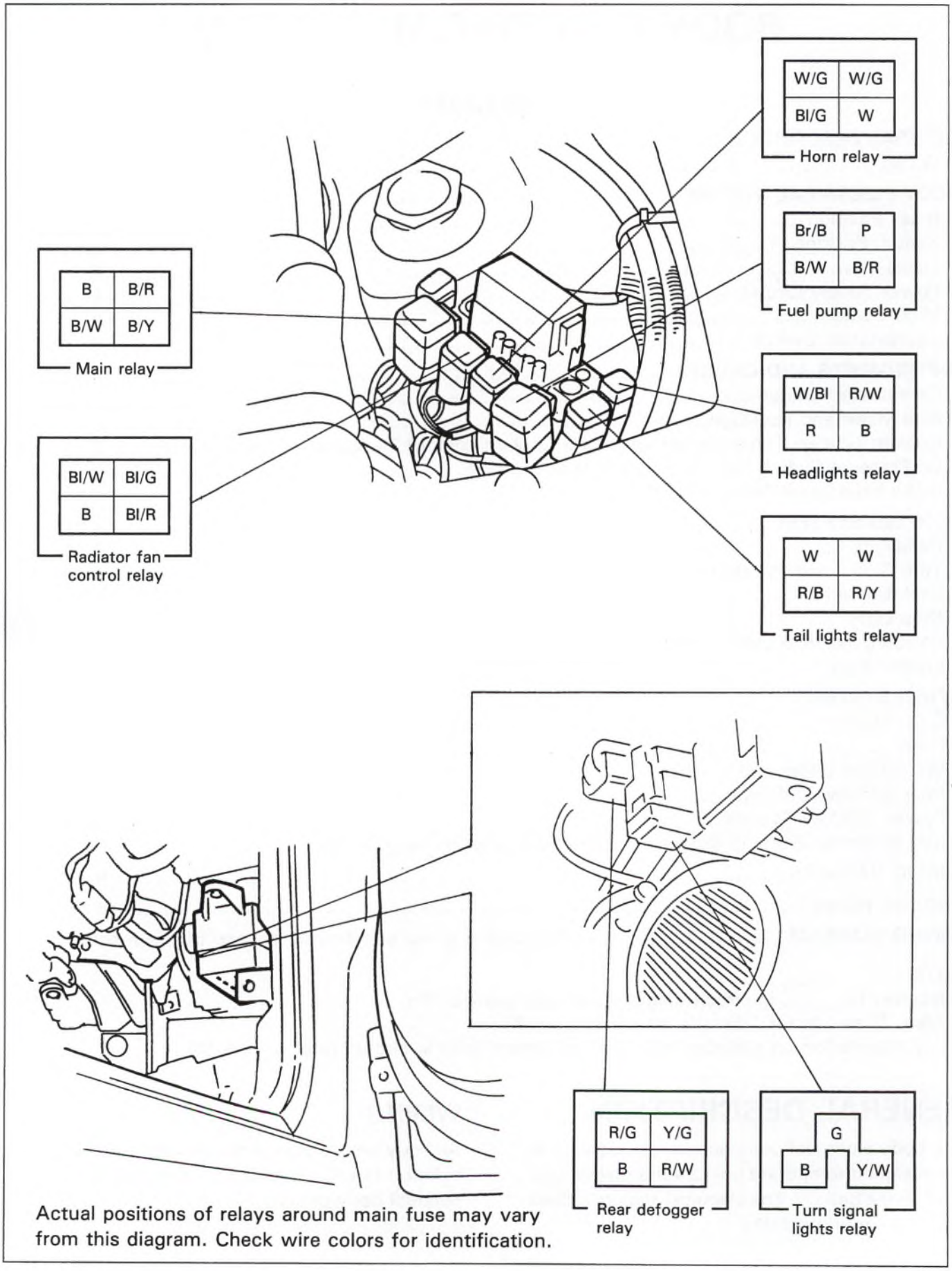
The body electrical components of this vehicle are designed to operate on 12 volts power supplied by the battery. The electrical system utilizes negative ground polarity.

WIRING

All body low voltage wires are insulated. The insulation is color coded for identification of individual body circuit.

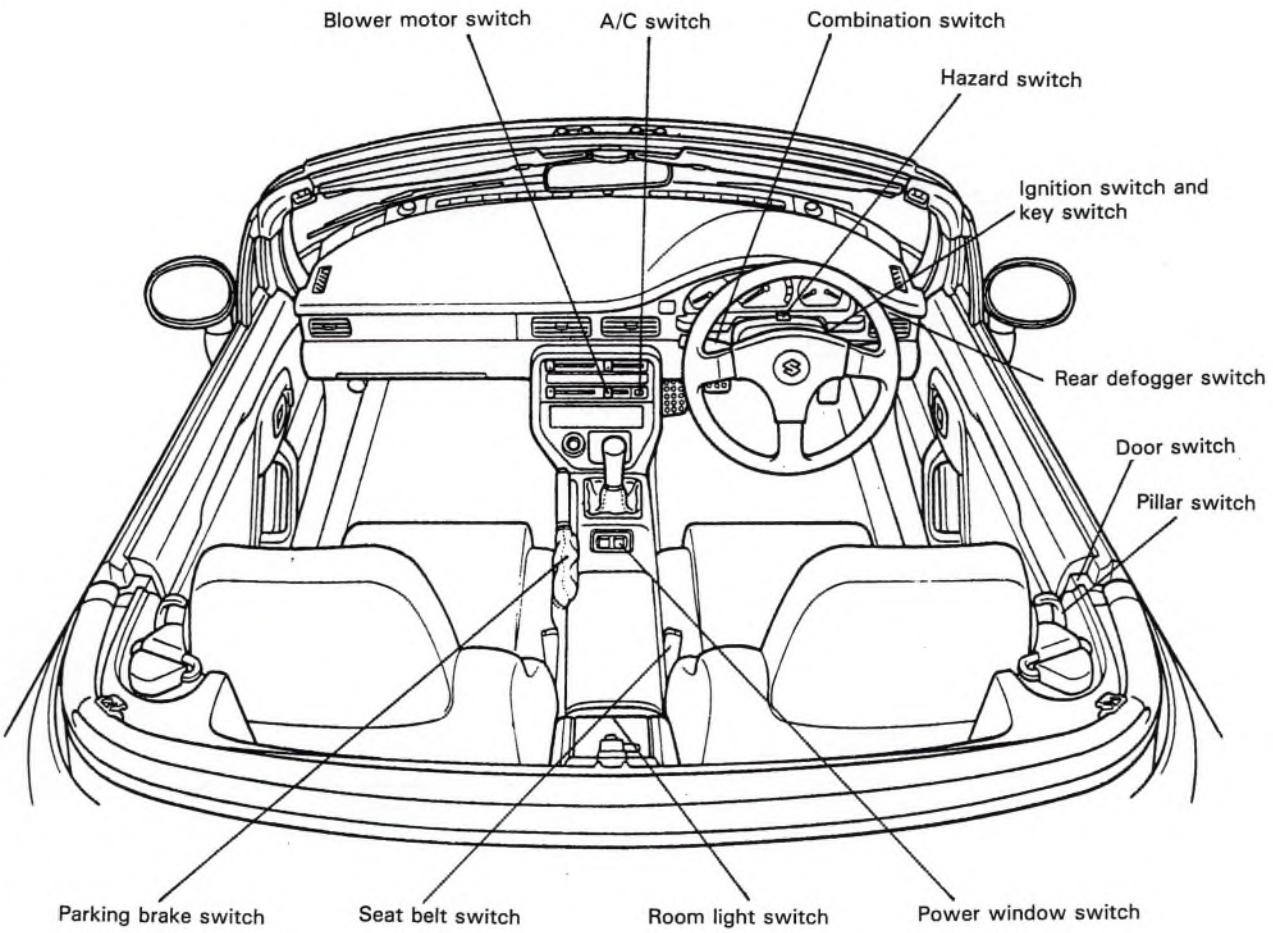
BODY ELECTRICAL SYSTEM

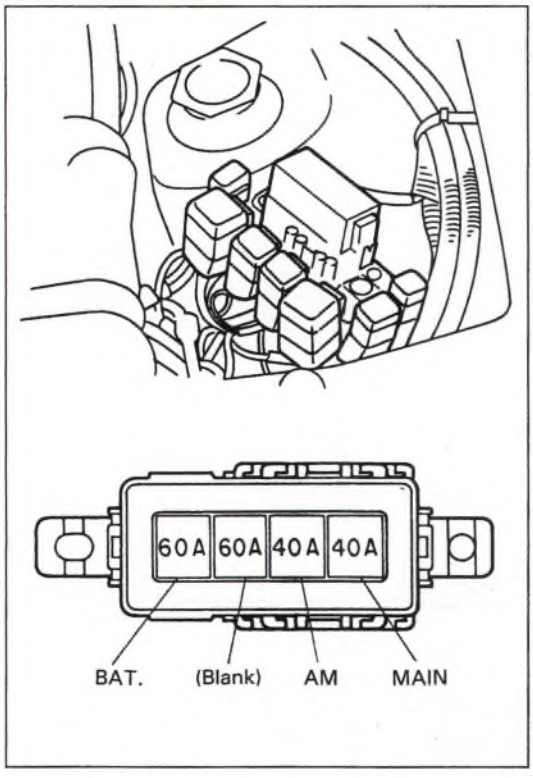
RELAY POSITION



Actual positions of relays around main fuse may vary from this diagram. Check wire colors for identification.

SWITCH POSITION



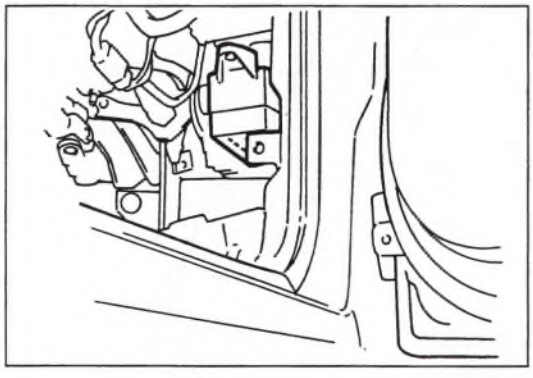


FUSES

MAIN FUSE

Amperage	Wire color	Circuit
60A	W/R	Generator and ignition switch
——	W	Blank
40A	W/Y	Fuses (Refer to p. 8-5.)
40A	W/G	Fuses (Refer to p. 8-5.)

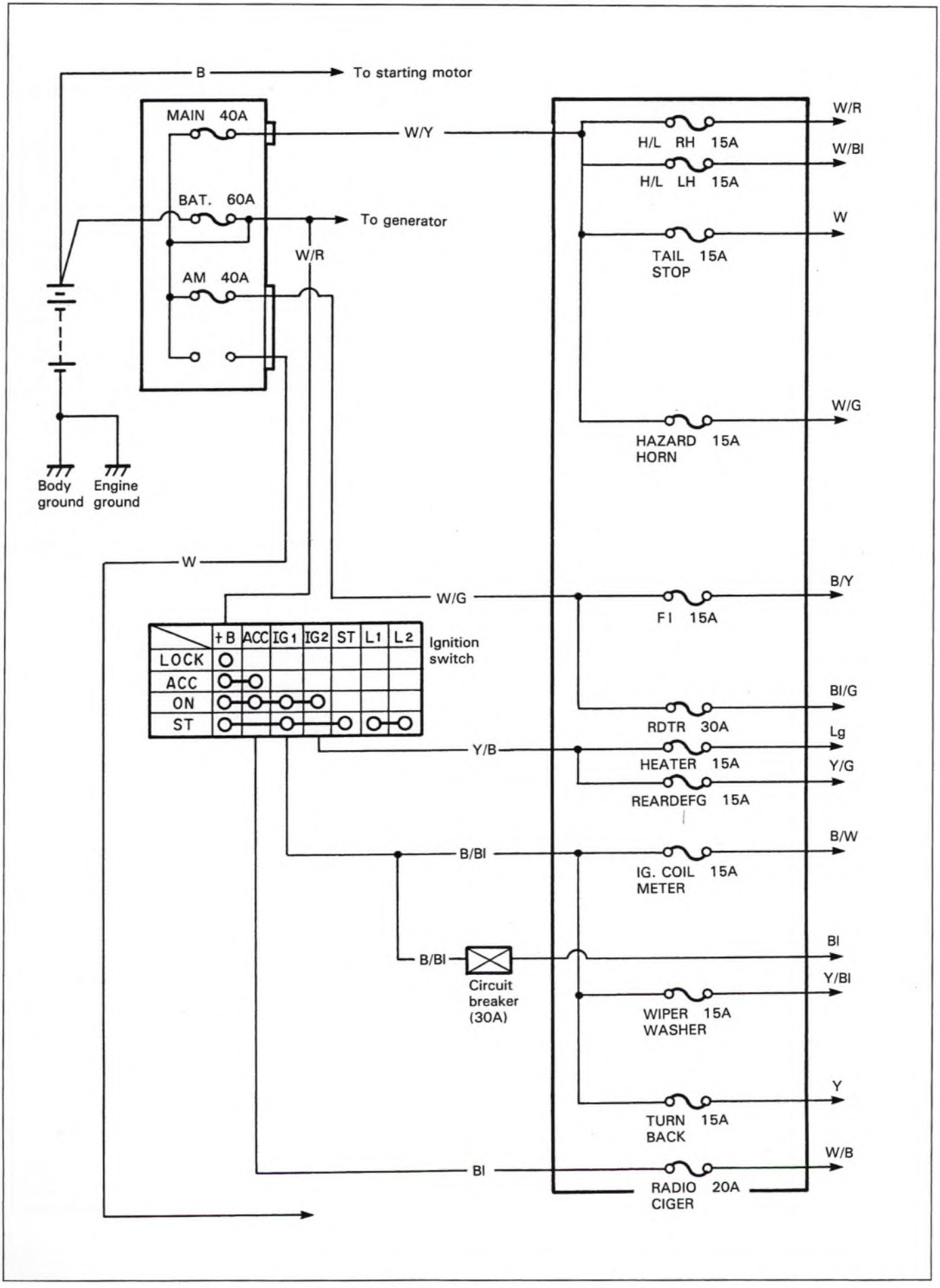
W/R : White/Red
W : White
W/Y : White/Yellow
W/G : White/Green

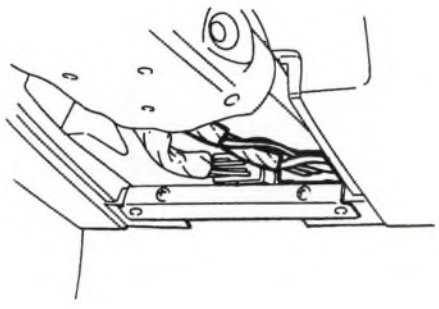


CIRCUIT FUSE

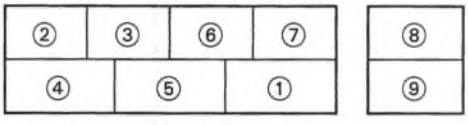
Amperage	Indication	Circuit
15A	H/L RH	Headlight RH
15A	H/L LH	Headlight LH and headlight relay
15A	TAIL STOP	Tail, stop and position light
15A	HAZARD HORN	Hazard and horn
30A	RDTR	Radiator fan control relay
15A	FI	Fuel injection main relay
15A	IG. COIL METER	Fuel injection main relay, fuel pump relay, ignition coil and combination meter
15A	WIPER WASHER	Combination switch and wiper motor
15A	TURN BACK	Turn signal and back-up light
15A	HEATER	Blower fan motor
15A	REAR DEFG	Rear defogger relay and switch
20A	RADIO CIGER	Radio and cigar lighter
30A	P/W	Power window switch

POWER SUPPLY CIRCUIT





Switch side terminal arrangement



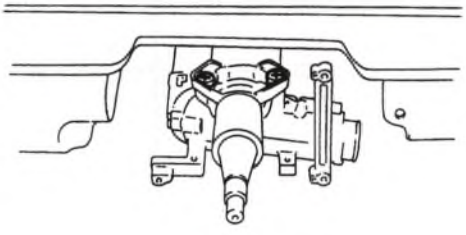
① : W/R
② : Bl
③ : B/Bl
④ : Y/B
⑤ : B/Y
⑥ : Br/B
⑦ : B
⑧ : W
⑨ : W/R

MAIN SWITCH

INSPECTION

1) Disconnect negative cable at battery.
2) Disconnect main switch lead wire at coupler.
3) Use a circuit tester to check continuity at each switch position.

Terminal		+B	ACC	IG1	IG2	ST	L1	L2	K1	K2
Key	Position	①	②	③	④	⑤	⑥	⑦	⑧	⑨
OUT	LOCK	○								
IN	ACC	○	○							
	ON	○	○	○	○					
	START	○		○		○	○	○		
									○	○

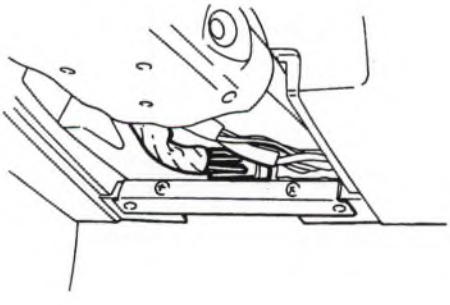


REMOVAL

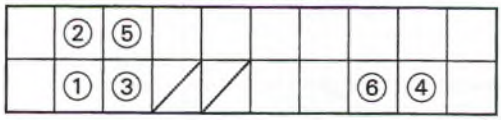
Remove steering column referring to SECTION 3C and remove main switch from steering column.

INSTALLATION

Install in reverse order of removal procedure.



Switch side terminal arrangement



COMBINATION SWITCH

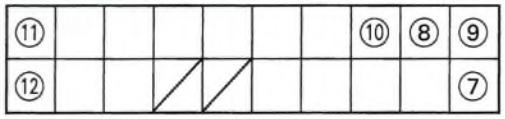
INSPECTION

1) Disconnect negative cable at battery.
2) Disconnect combination switch lead wire at coupler.
3) Use a circuit tester to check continuity at each switch position.

TURN SIGNAL AND HAZARD SWITCH

HAZ.	Wire color / TURN	G/Y ①	G/R ②	G ③	Y ④	Y/W ⑤	W/G ⑥
OFF	R	○		○			
	N				○	○	
	L		○	○			
ON	R–N–L	○	○	○		○	○

Switch side terminal arrangement

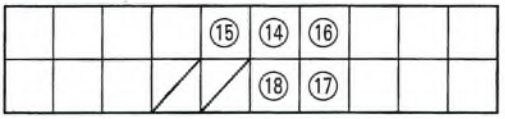


⑦ : B ⑨ : W ⑪ : R
⑧ : Br/Y ⑩ : R/Y ⑫ : R/W

LIGHTING AND DIMMER SWITCH

Switch	⑦	⑧	⑨	⑩	Switch	⑦	⑪	⑫	⑧
OFF					HI		○		○
I			○	○	LO			○	○
II	○	○	○	○	PASS	○	○		

Switch side terminal arrangement

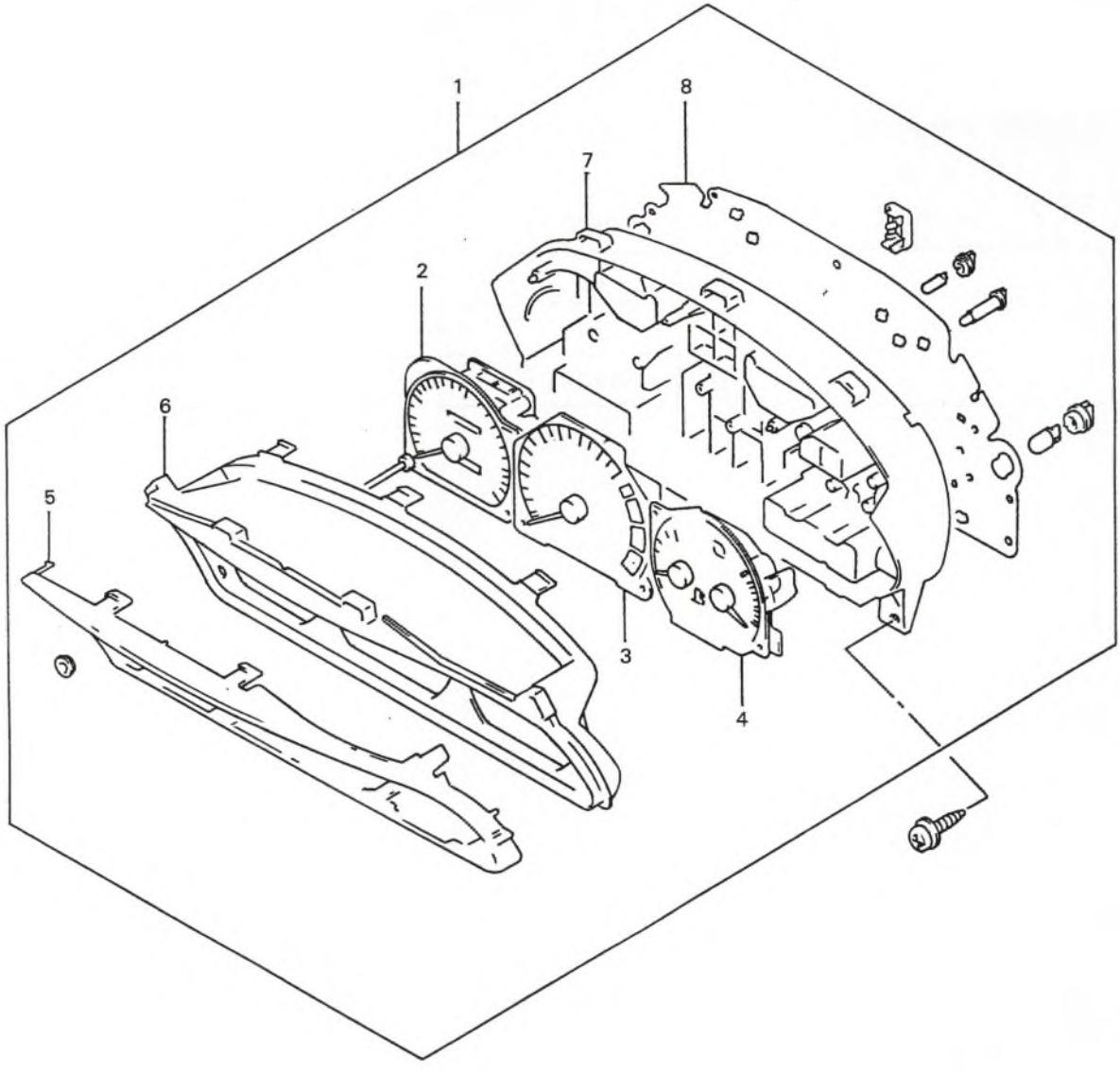


WIPER AND WASHER SWITCH

Wire color / Switch	Bl/R ⑭	Bl ⑮	Bl/W ⑯	— INT1	— INT2	Y/Bl ⑰	Bl/B ⑱
OFF		○	○				
INT		○	○	○	○		
LO		○				○	
HI	○					○	
WASH						○	○

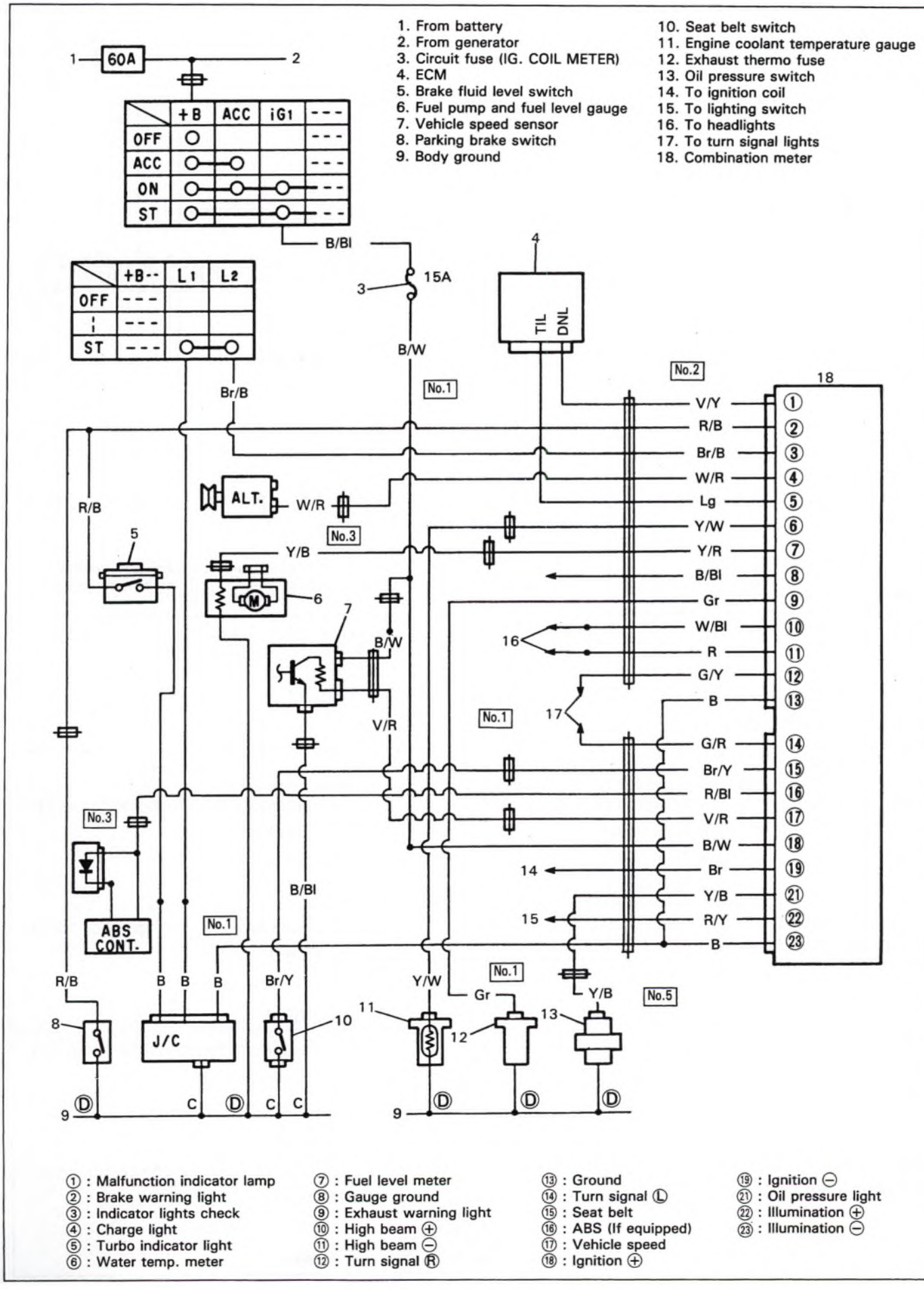
INSTRUMENTS AND GAUGES

COMBINATION METER

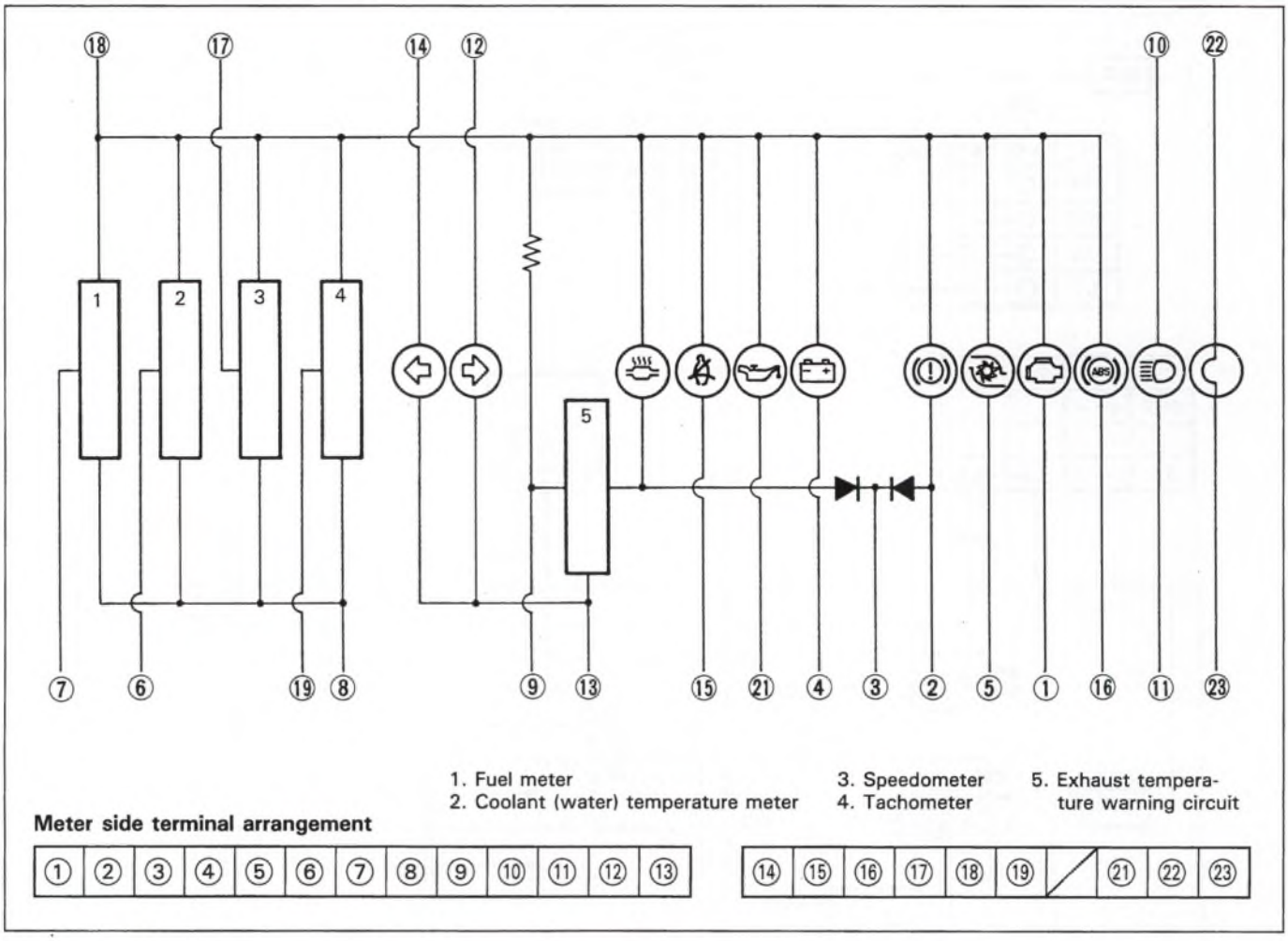


1. Combination meter ass'y
2. Speedometer body ass'y
3. Tachometer body ass'y
4. Fuel and temperature meter body ass'y
5. Meter window glass
6. Meter window
7. Meter case
8. Circuit plate

COMBINATION METER SYSTEM WIRING



COMBINATION METER WIRING

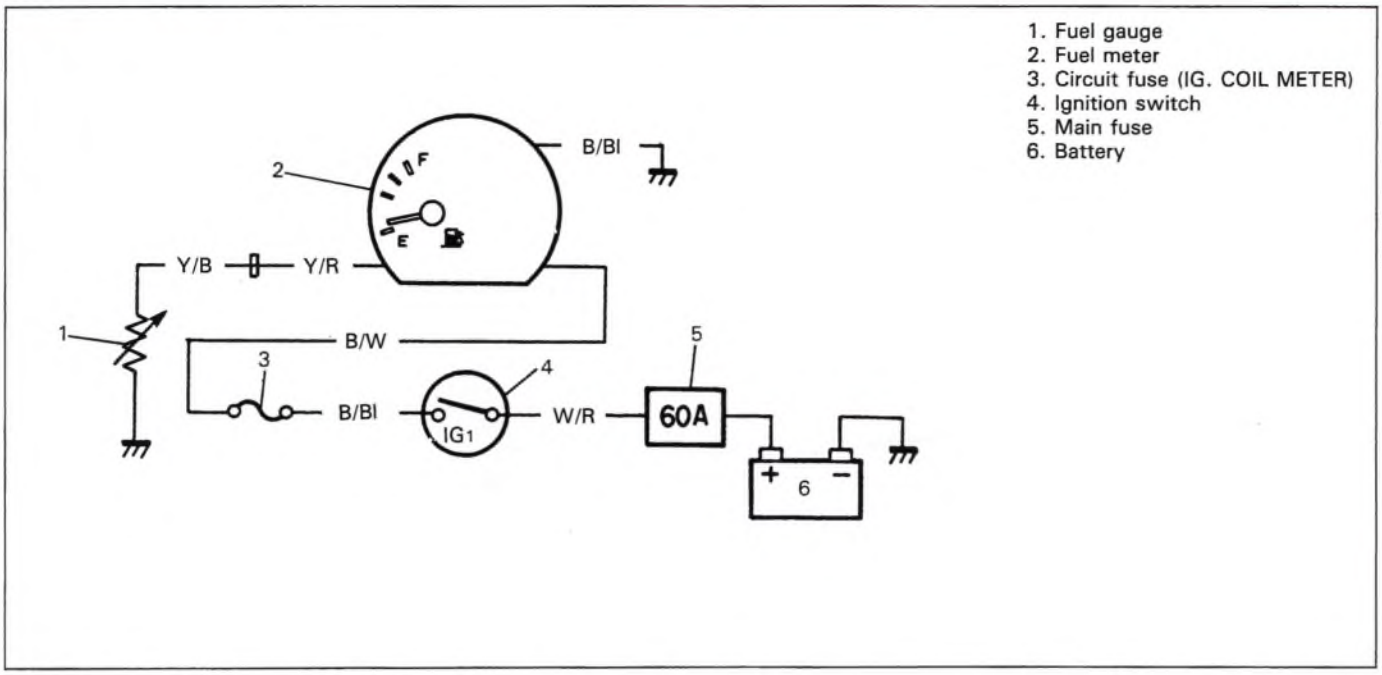


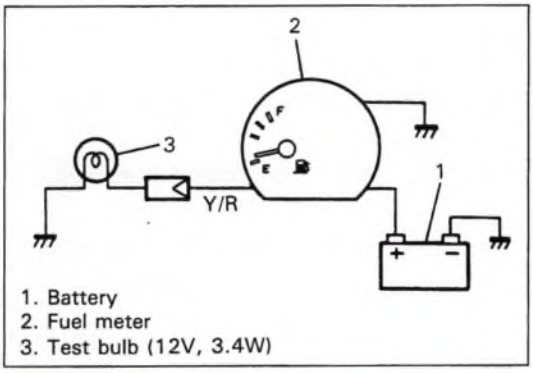
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Fuel level meter shows no operation	• Meter fuse blown • Fuel meter faulty • Fuel level gauge unit faulty • Wiring or grounding faulty	Replace fuse to check for short. Check meter. Check gauge unit. Repair.
Coolant (Water) temp. meter shows no operation	• Meter fuse blown • Coolant (Water) temp. meter faulty • Coolant (Water) temp. gauge faulty • Wiring or grounding faulty	Replace fuse to check for short. Check meter. Check gauge unit. Repair.
Oil pressure warning light shows no lighting	• Light fuse blown • Bulb burnt out • Oil pressure switch faulty • Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Check switch. Repair.
Brake warning light shows no lighting	• Light fuse blown • Bulb burnt out • Brake fluid level switch faulty • Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Check switch. Repair.

FUEL METER AND FUEL GAUGE UNIT

WIRING CIRCUIT

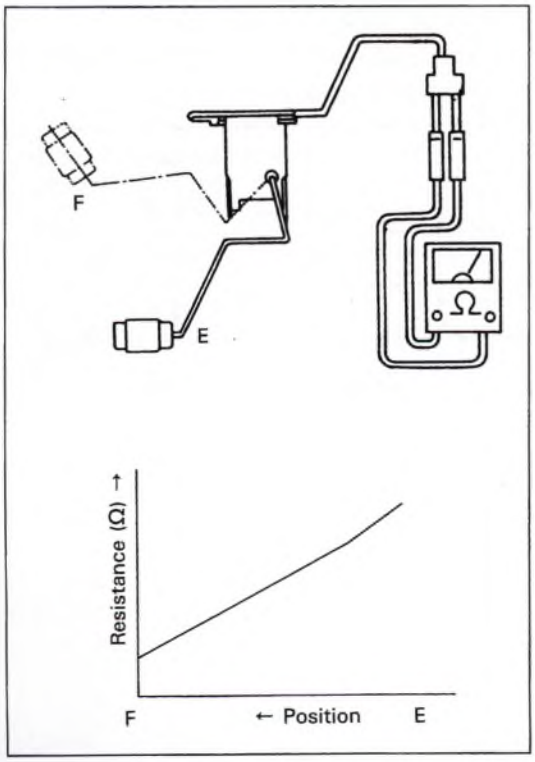




INSPECTION

FUEL METER

1) Disconnect Y/R (Yellow/Red) lead wire going to gauge unit.
2) Use a bulb (12V, 3.4W) in position to ground lead wire as illustrated.
3) Turn ignition switch ON. Make sure that bulb is lighted with meter pointer fluctuating several seconds thereafter. If meter is faulty, replace.



FUEL GAUGE UNIT

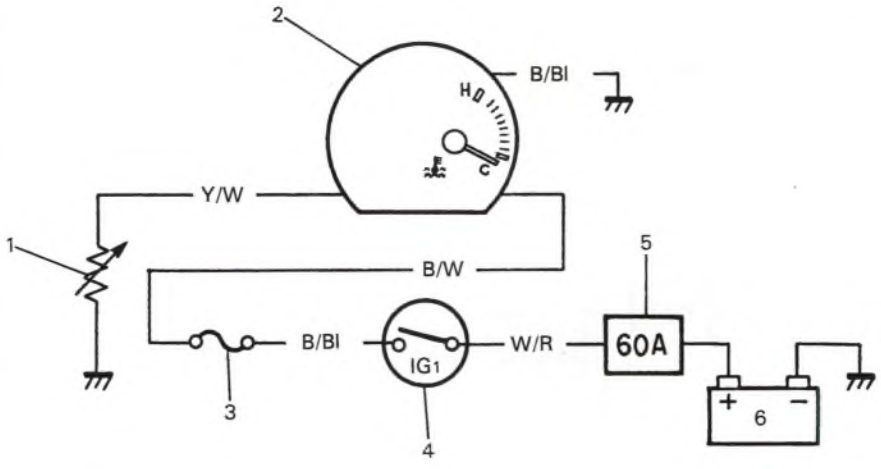
Use an ohmmeter to confirm that resistance of level gauge unit changes with change in float position.

Position	Resistance (Ω)
E	120±8
1/2	32±4
F	3±2

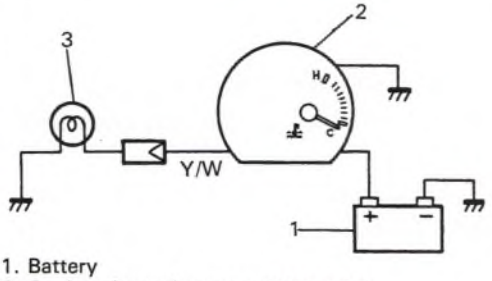
Float postion-to-resistance relationship can be plotted in a graph as shown at the left.

COOLANT (WATER) TEMPERATURE METER AND COOLANT (WATER) TEMPERATURE GAUGE UNIT

WIRING CIRCUIT



1. Coolant (water) temperature gauge
2. Coolant (water) temperature meter
3. Circuit fuse (IG. COIL METER)
4. Ignition switch
5. Main fuse
6. Battery

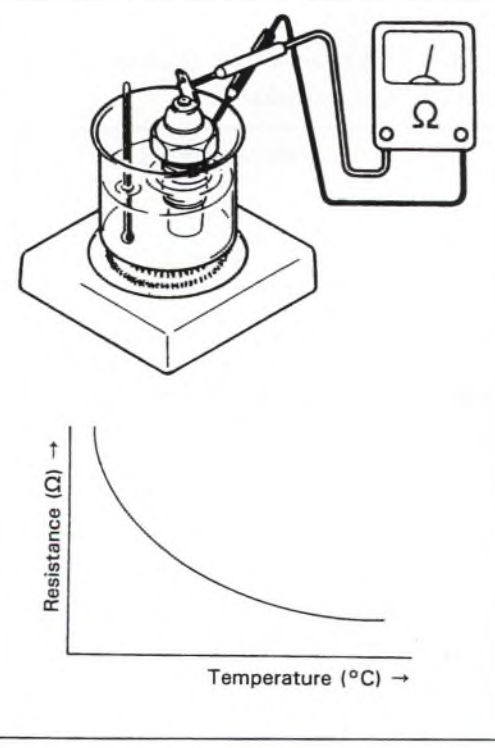


1. Battery
2. Coolant (water) temperature meter
3. Test bulb (12V, 3.4W)

INSPECTION

COOLANT (WATER) TEMPERATURE METER

1) Disconnect Y/W (Yellow/White) lead wire going to gauge unit installed in intake manifold.
2) Use a bulb (12V, 3.4W) in position to ground lead wire as illustrated.
3) Turn ignition switch ON. Confirm that bulb is lighted with meter pointer fluctuating several seconds thereafter. If meter is faulty, replace.



COOLANT (WATER) TEMEPRATURE GAUGE UNIT

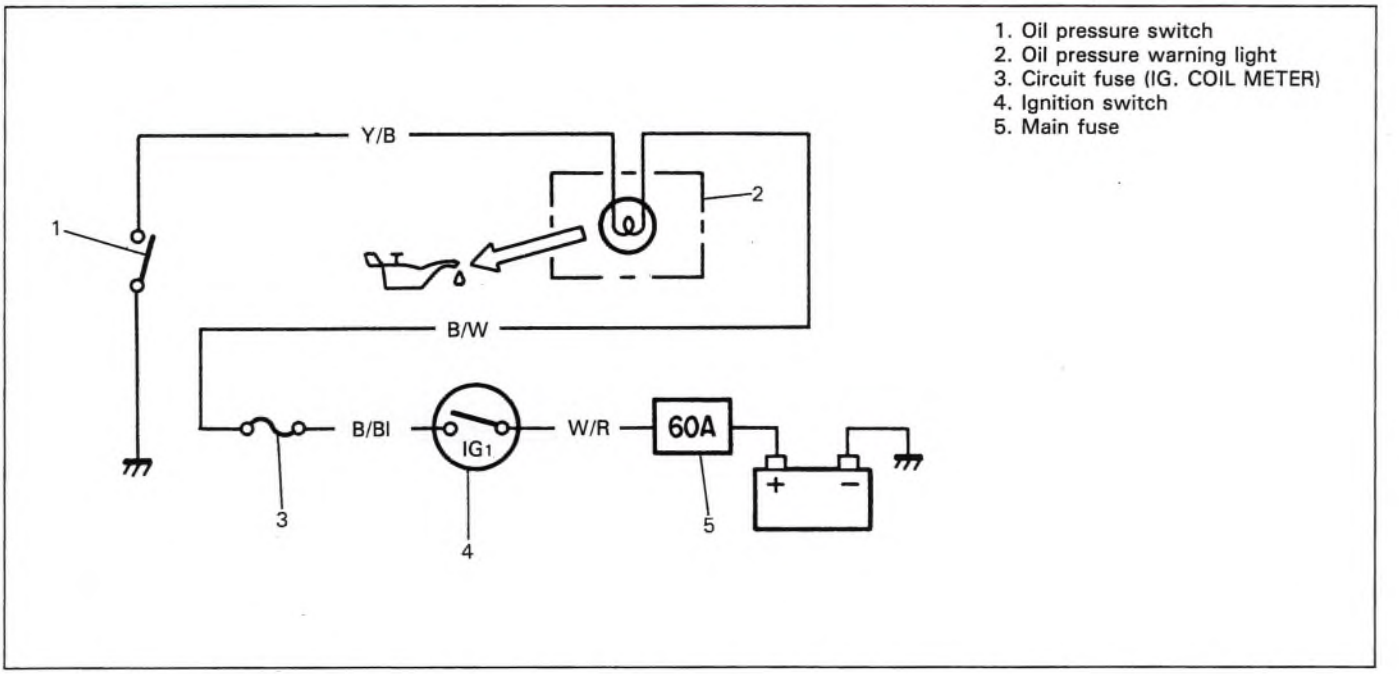
Warm up gauge unit. Thus make sure its resistance is decreased with increase in its temperature.

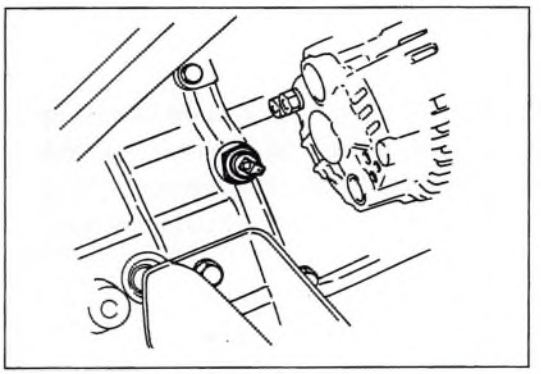
Temperature (°C)	Resistance (Ω)
50	133.9—178.9
80	47.5— 56.8
100	26.2— 29.3

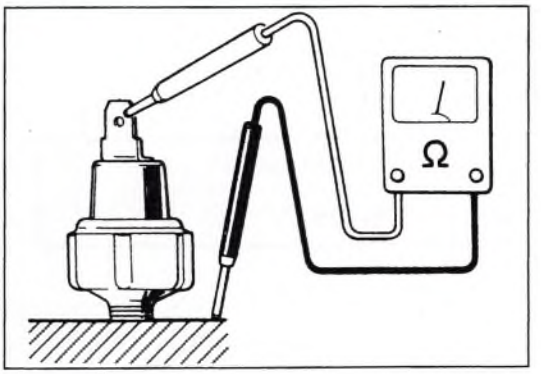
Temperature-to-resistance relationship can be plotted in a graph as shown in left figure.

OIL PRESSURE SWITCH AND OIL PRESSURE WARNING LIGHT

WIRING CIRCUIT







INSPECTION

OIL PRESSURE SWITCH

Disconnect oil pressure switch wire at switch. And use an ohmmeter to check switch continuity.

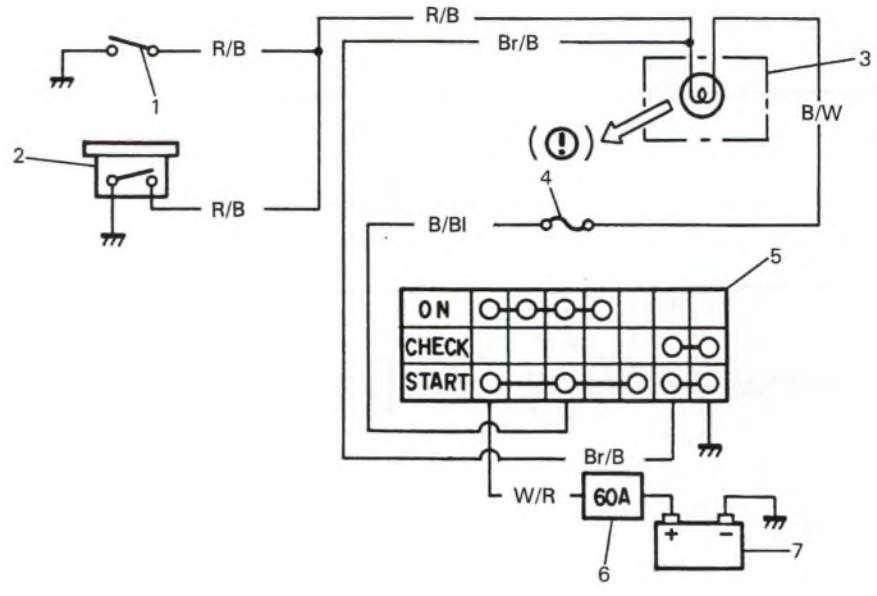
During engine running	No continuity obtained
At engine stop	Continuity obtained

OIL PRESSURE WARNING LIGHT

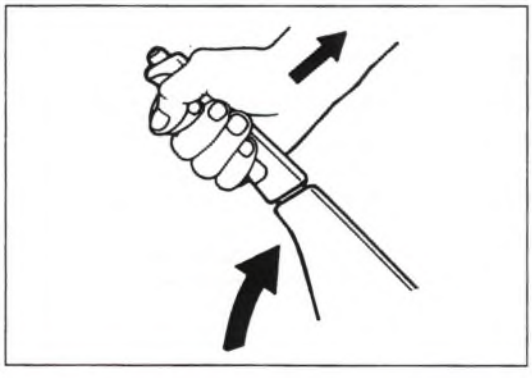
1) Disconnect oil pressure switch wire at switch and ground disconnected wire.
2) Turn ignition switch ON. Make sure that oil pressure warning light is ON.

BRAKE FLUID LEVEL SWITCH AND BRAKE WARNING LIGHT

WIRING CIRCUIT



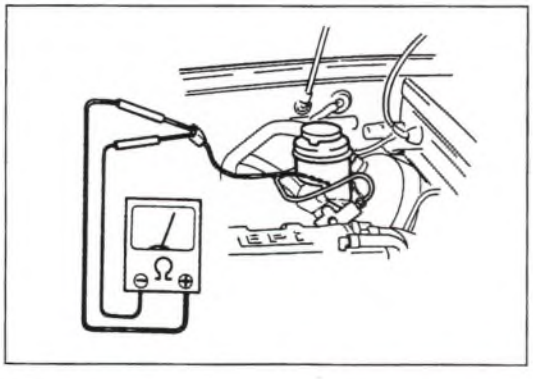
1. Parking brake switch
2. Brake fluid level switch
3. Brake warning light
4. Circuit fuse
5. Ignition switch
6. Main fuse
7. Battery



INSPECTION

BRAKE WARNING LIGHT

1) Warning light comes ON when engine is stopped while ignition switch is turned ON and parking brake is applied.
2) For bulb check, check that warning light comes ON briefly during engine start regardless of brake fluid level position and parking brake operation.
3) After engine starting, release parking brake.
 If light goes off, brake fluid level is adequate.

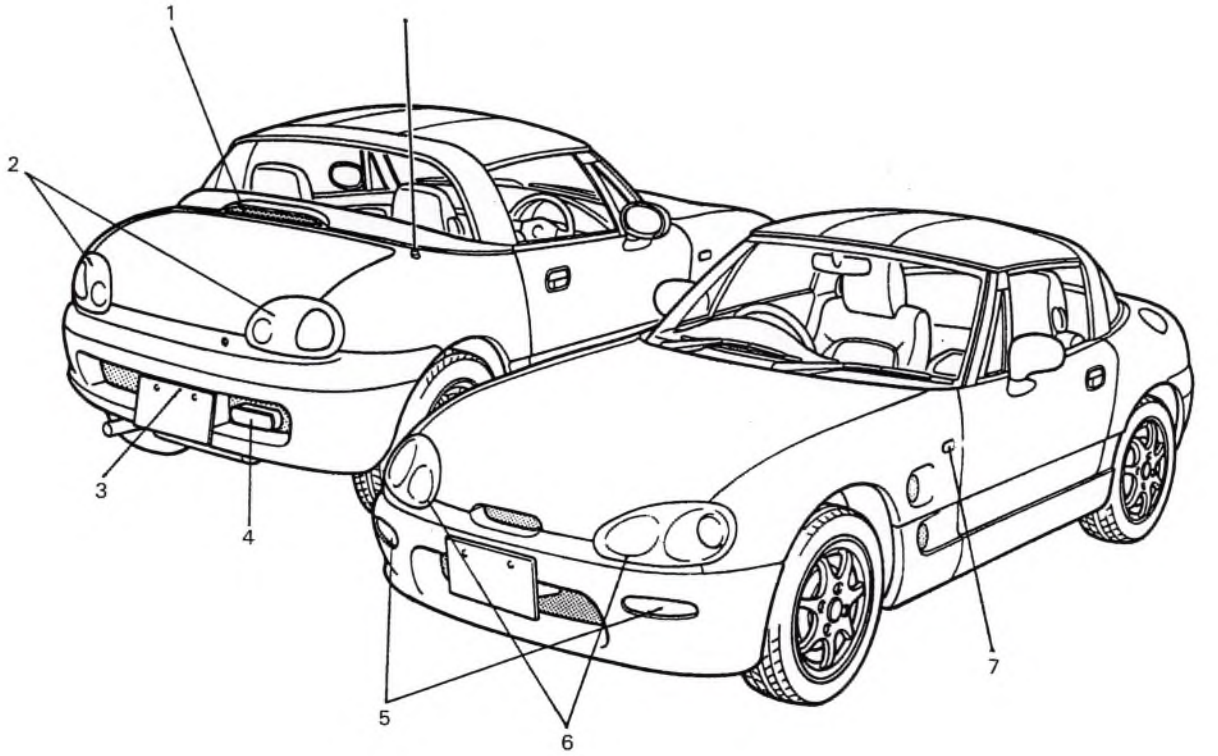


BRAKE FLUID LEVEL SWITCH

Use an ohmmeter to check switch for continuity.
If found defective, replace switch.

OFF position (float up)	No continuity
ON position (float down)	Continuity

LIGHTING SYSTEM

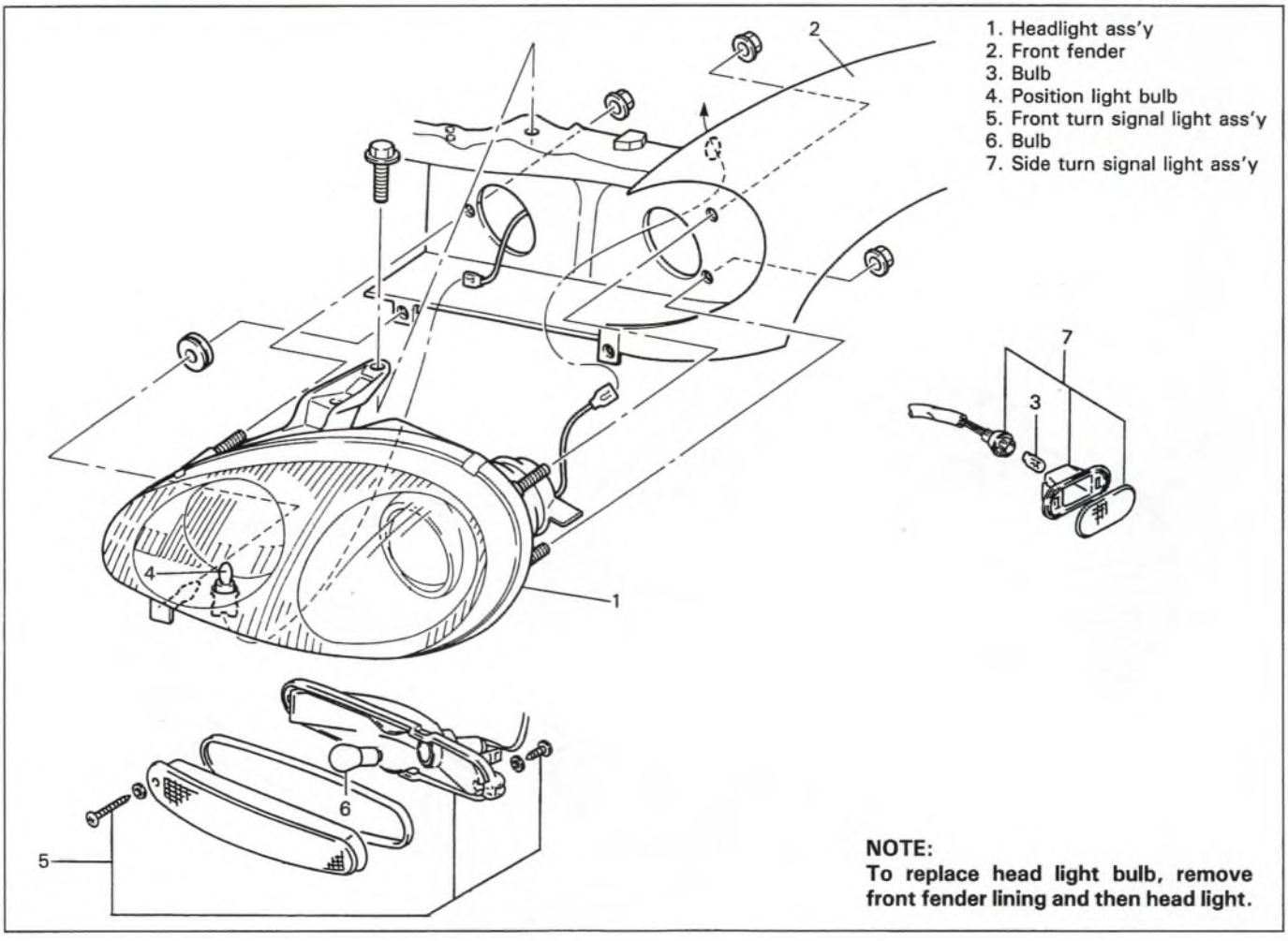


1. High mount stop light
2. Tail ,stop and rear turn signal lights
3. Licence light
4. Back-up light
5. Front turn signal lights
6. Head and position lights
7. Side turn signal light

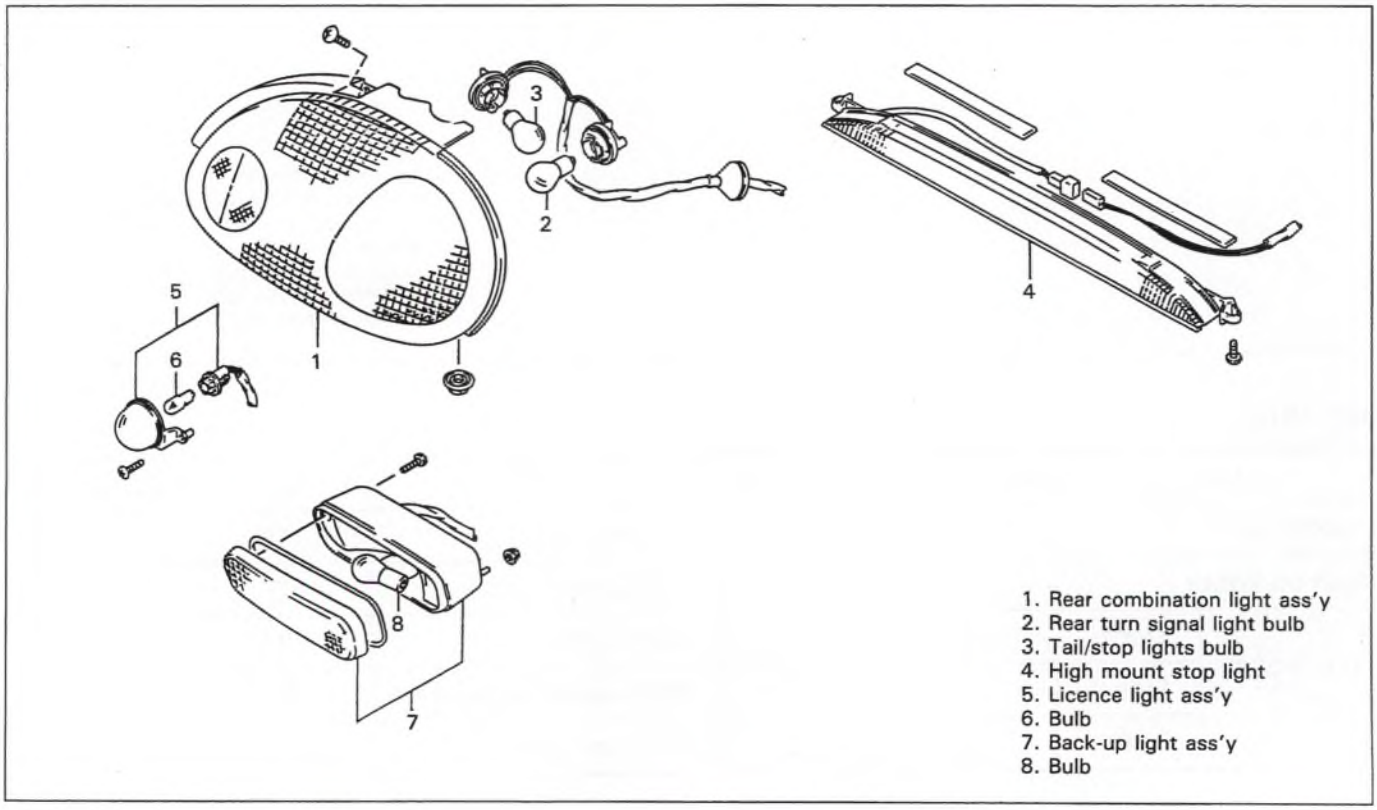
LIGHT BULB

Use		Wattage (W)	Quantity	Use	Wattage (W)	Quantity
Headlights		55x2/55	4	Licence light	10	1
Position lights		5	2	Tail lights	5	2
Turn signal lights	Front	21	2	Stop lights	21	2
	Side	5	2	High mount stop light	3.3	1
	Rear	21	2	Back-up light	21	1

FRONT LIGHTS

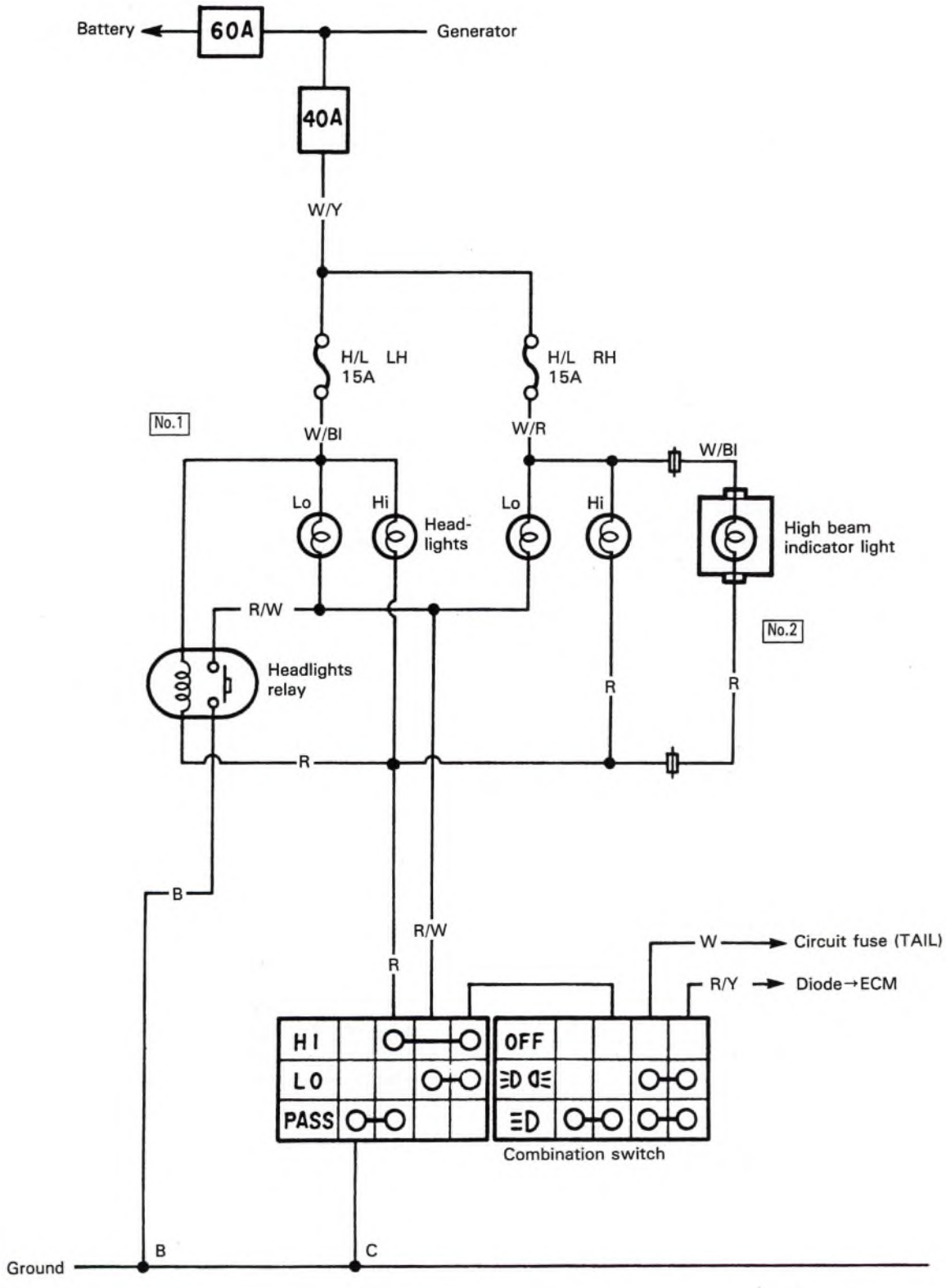


REAR LIGHTS



HEADLIGHT

WIRING CIRCUIT



TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Only one light does not light	• Bulb burnt out • Fuse blown • Socket, wiring or grounding faulty	• Replace bulb. • Replace fuse. • Repair as necessary.
Headlights do not light	• Main fuse and/or fuses blown • Lighting and dimmer switches faulty • Wiring or grounding faulty	• Replace main fuse and/or fuses to check for short. • Check switches. • Repair as necessary.
Only one beam (Hi'' or ''Lo'') does not light	• Lighting or dimmer switch faulty.	• Check switch.

SETTING HEADLIGHT BEAMS (HEADLIGHTS AIMING)

Preparation

- Adjust air pressure of each tire as specified respectively.
- Check that engine oil and coolant are filled up to correct level.
- Check that fuel tank is filled with fuel fully.
- Place vehicle on a level floor.
- Bounce each corner of vehicle by hand to settle its balance.

NOTE:

There should be no other load in vehicle other than driver.

For headlight beam settinig, some different methods and instruments are in use now, e.g., screen method using a focusing tester, etc. But method described here does not use such tester.

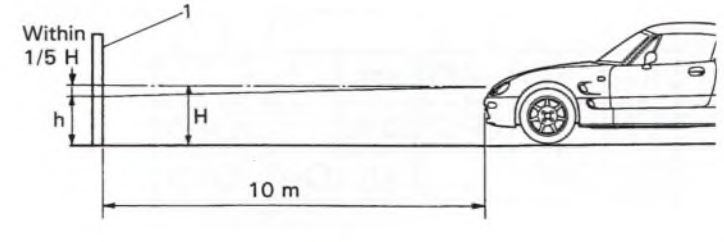
Unless otherwise obligated by local regulation, align headlight aims according to following procedure.

1) Set a blank wall 10 m ahead of headlights.
2) Light headlight (high beam) and check where on wall hot spot (high intensity zone) of each high beam falls.
 If should be within a vertical range on wall from headlight height ''H'' to height ''h'' switch is 1/5 of H lower therefrom as shown below.

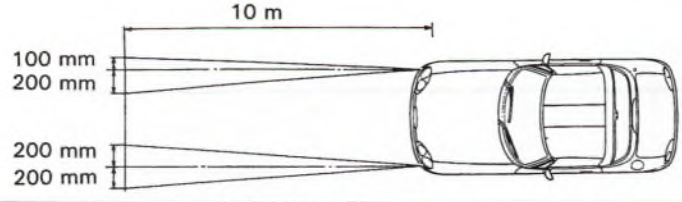
 NOTE:
 Cover low beam headlights and high beam one which is not subject to this adjustment.

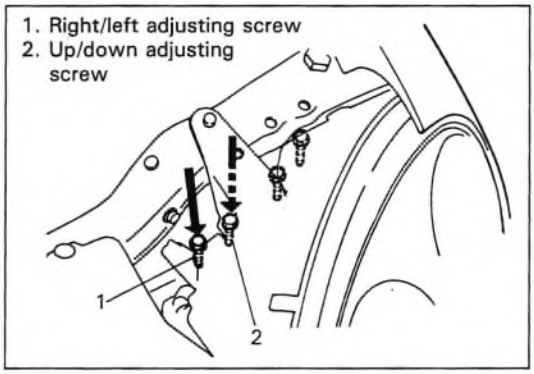
3) Check that hot spot of each main (high) beam is within a horizontal range on wall as specified below.

 NOTE:
 Cover low beam headlights and high beam one which is not subject to this adjustment.



1. Screen

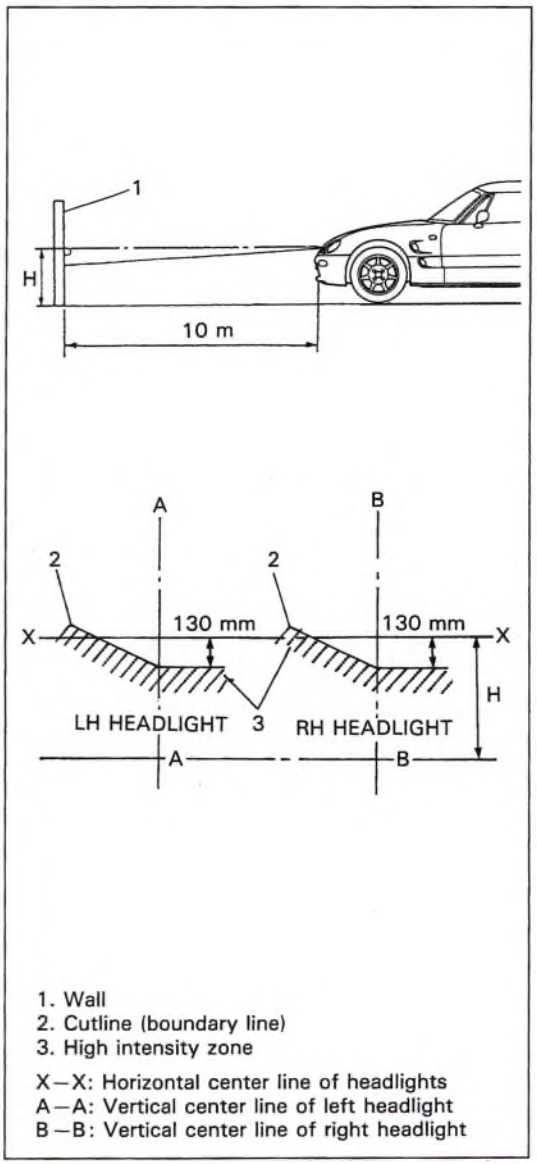




4) When headlight beam is not within range as specified in Steps 2) and 3), make adjustment by turning adjusting screw.

NOTE:

- **As light beam moves diagonally when right/left adjusting screw is used, make right/left adjustment before up/down adjustment.**
- **Adjustment should be completed by turning adjusting screw in tightening direction.**



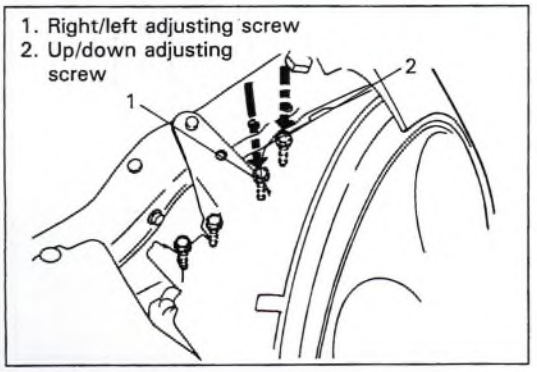
1. Wall
2. Cutline (boundary line)
3. High intensity zone

X—X: Horizontal center line of headlights
A—A: Vertical center line of left headlight
B—B: Vertical center line of right headlight

5) Light headlights (low beam) and check their beams projected on the wall. They should correspond to shadowed portion in figure at the left.

NOTE:

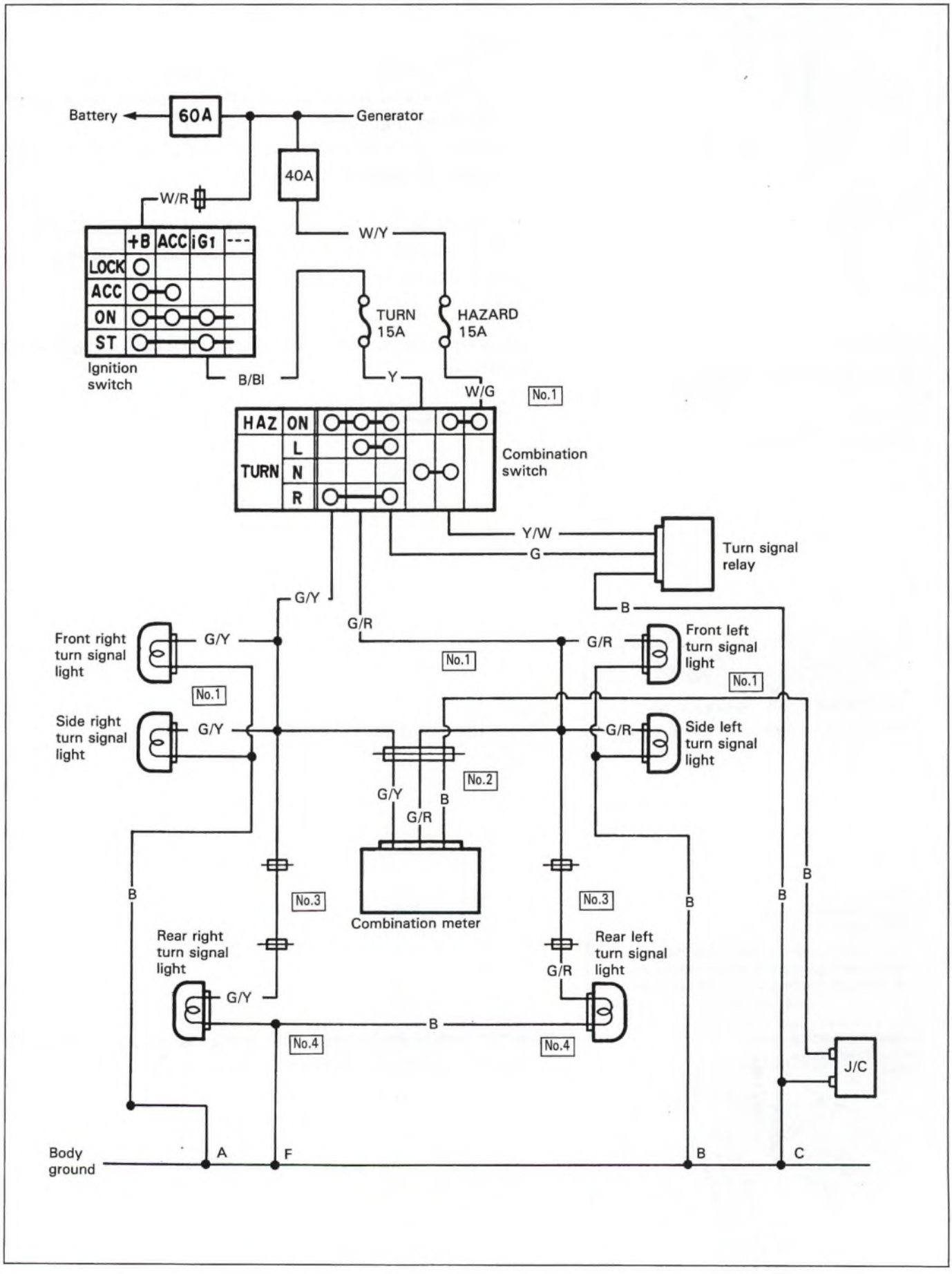
Be sure to cover headlight which is not subject to this adjustment.



6) When headlight beam is not within range as specified in Step 5), make adjustment by turning adjusting screw.

TURN SHIGNAL AND HAZARD LIGHT

WIRING CIRCUIT

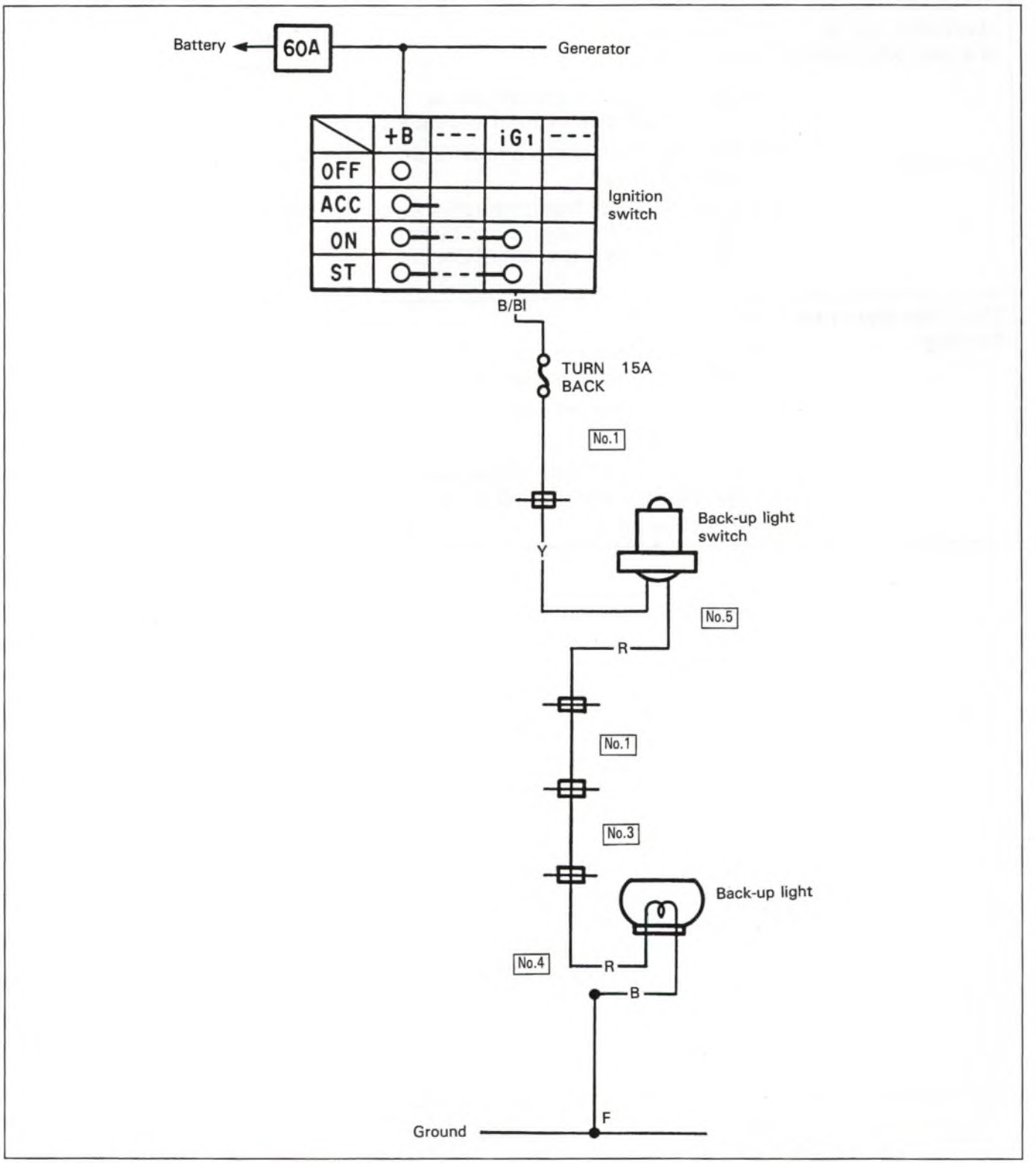


TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Flash rate high or one side only flashes	• Faulty gorund	• Repair.
	• Wrong bulb	• Replace.
	• One of light bulbs burnt out or right or left side of front or rear side	• Replace.
	• Defective turn signal-and-hazard warning relay	• Replace
	• Open circuit or high resistance existing beween turn signal-and-hazard warning switch and lights ON one side	• Repair or replace.
Flash rate low or no flashing	• Wrong bulb	• Replace.
	• One of bulbs burnt out or right or left side of front or rear side	• Replace.
	• Supply voltage too low	• Recharge battery.
	• Fuse blown	• Replace.
	• Open circuit or high resistance existing between battery and switch	• Repair
	• Defective relay	• Replace.

BACK-UP LIGHT

WIRING CIRCUIT

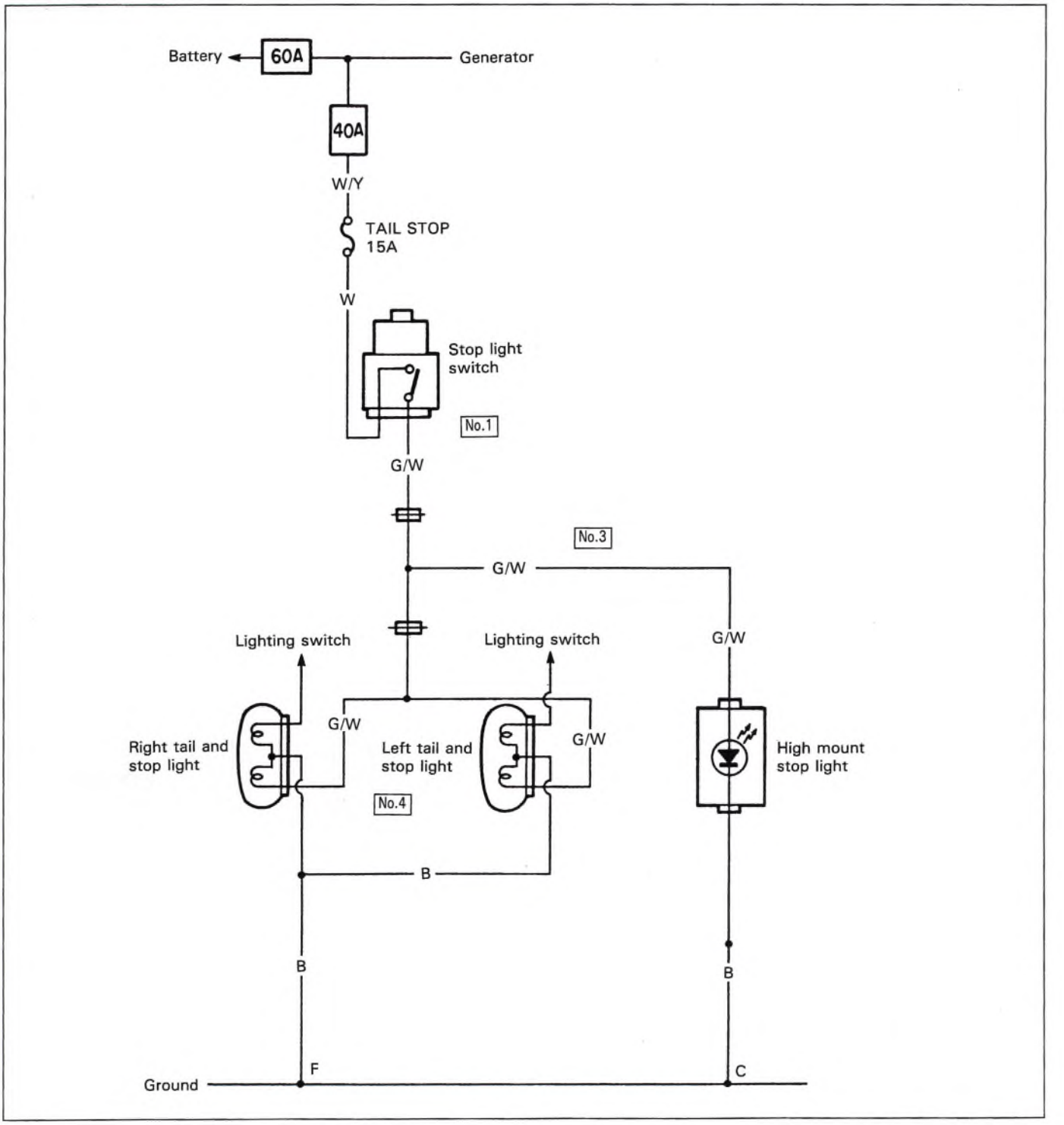


TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Light does not light	• Fuse blown	• Replace fuse to check for short.
	• Bulb burned out	• Replace.
	• Back-up light switch faulty	• Check switch.
	• Wiring or grounding faulty	• Repair as necessary.

STOP LIGHT

WIRING CIRCUIT

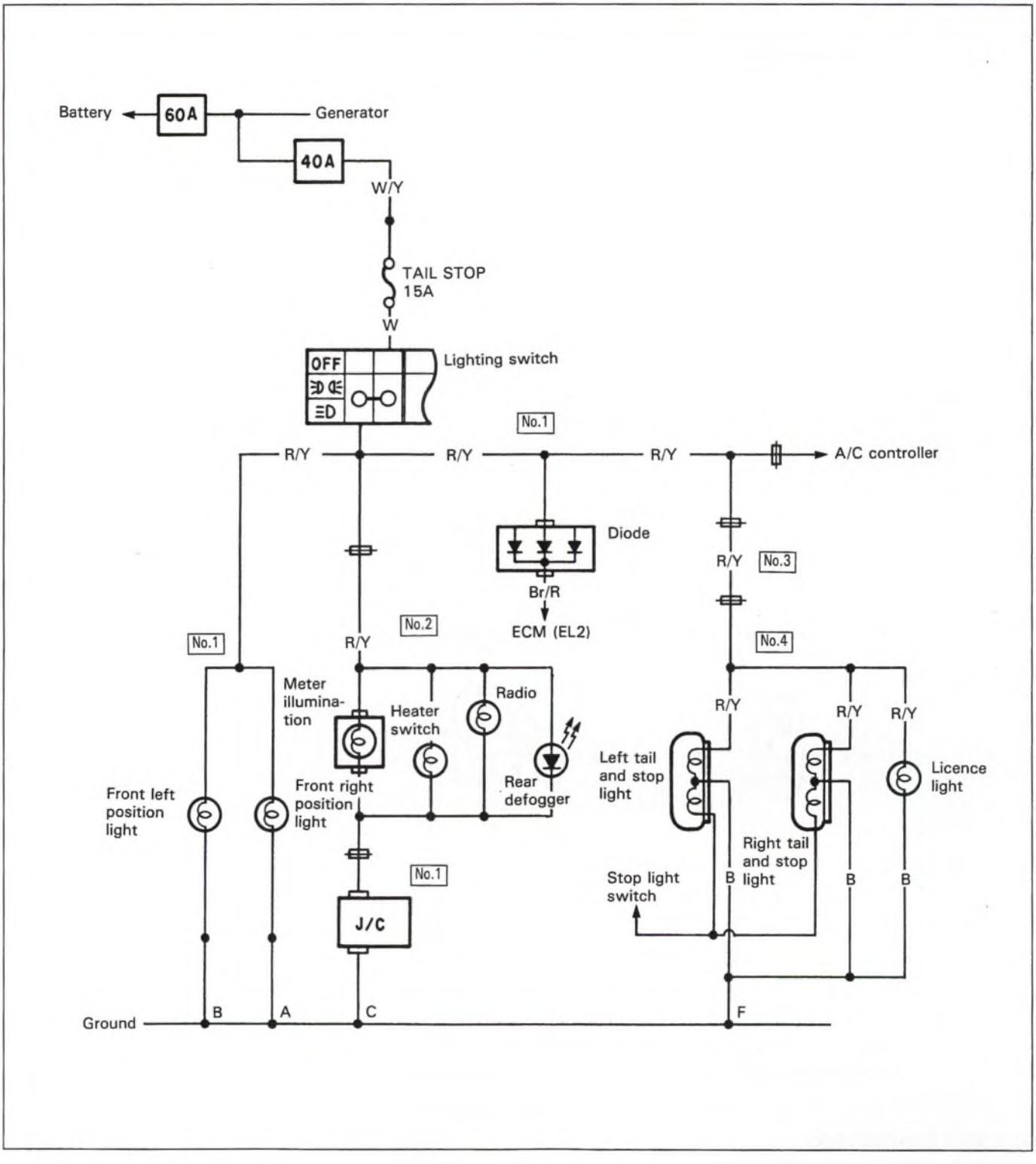


TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Stop lights do not light	• Fuse blown • Bulb burned out • Stop light switch faulty • Wiring or grounding faulty	• Replace fuse to check for short. • Replace. • Adjust or replace switch. • Repair as necessary.
Stop lights stay ON	• Stop light switch faulty or mladjusted	• Adjust or replace switch.

POSITION, TAIL AND LICENCE LIGHT

WIRING CIRCUIT

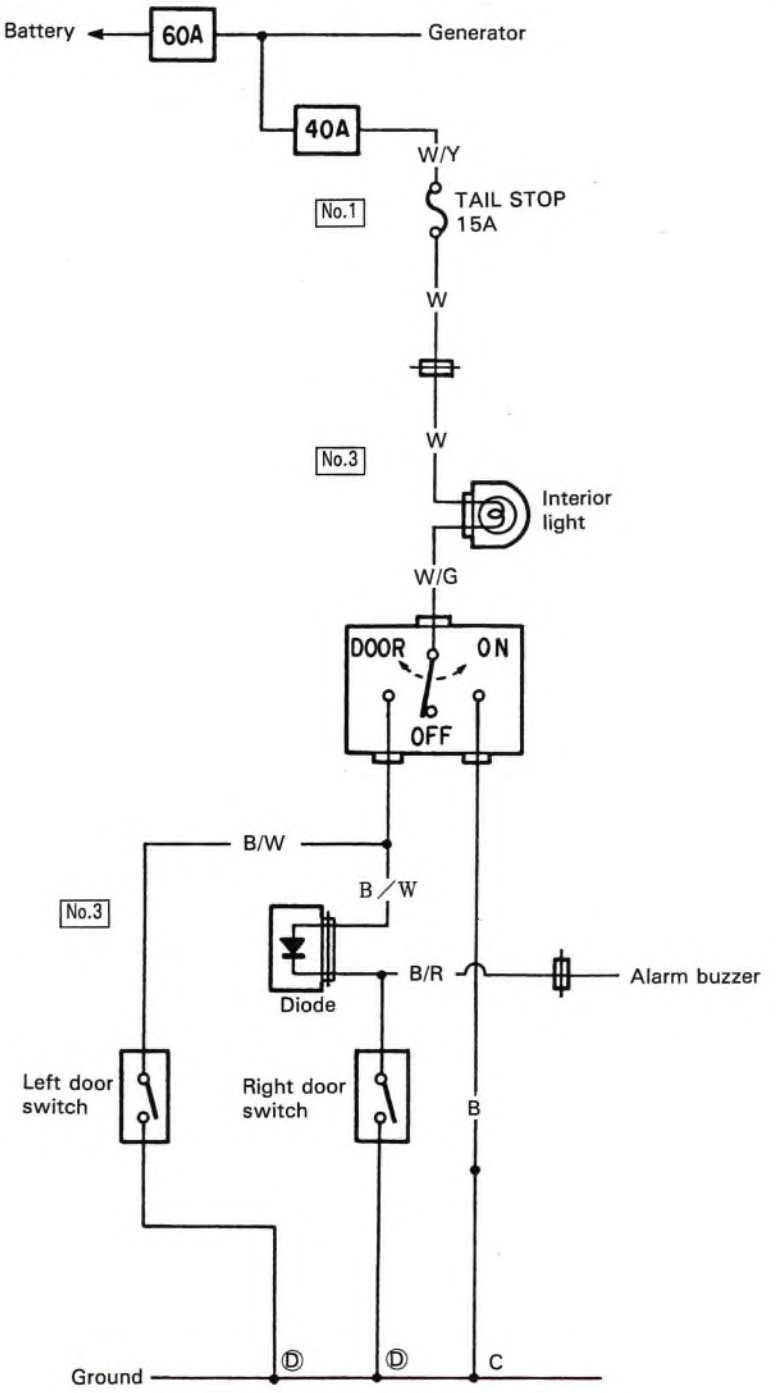


TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Lights do not light	• Fuse blown	• Replace fuse to check for short.
	• Bulb burned out	• Replace.
	• Lighting switch faulty	• Check switch.
	• Wiring or grounding faulty	• Repair as necessary.

INTERIOR LIGHT

WIRING CIRCUIT



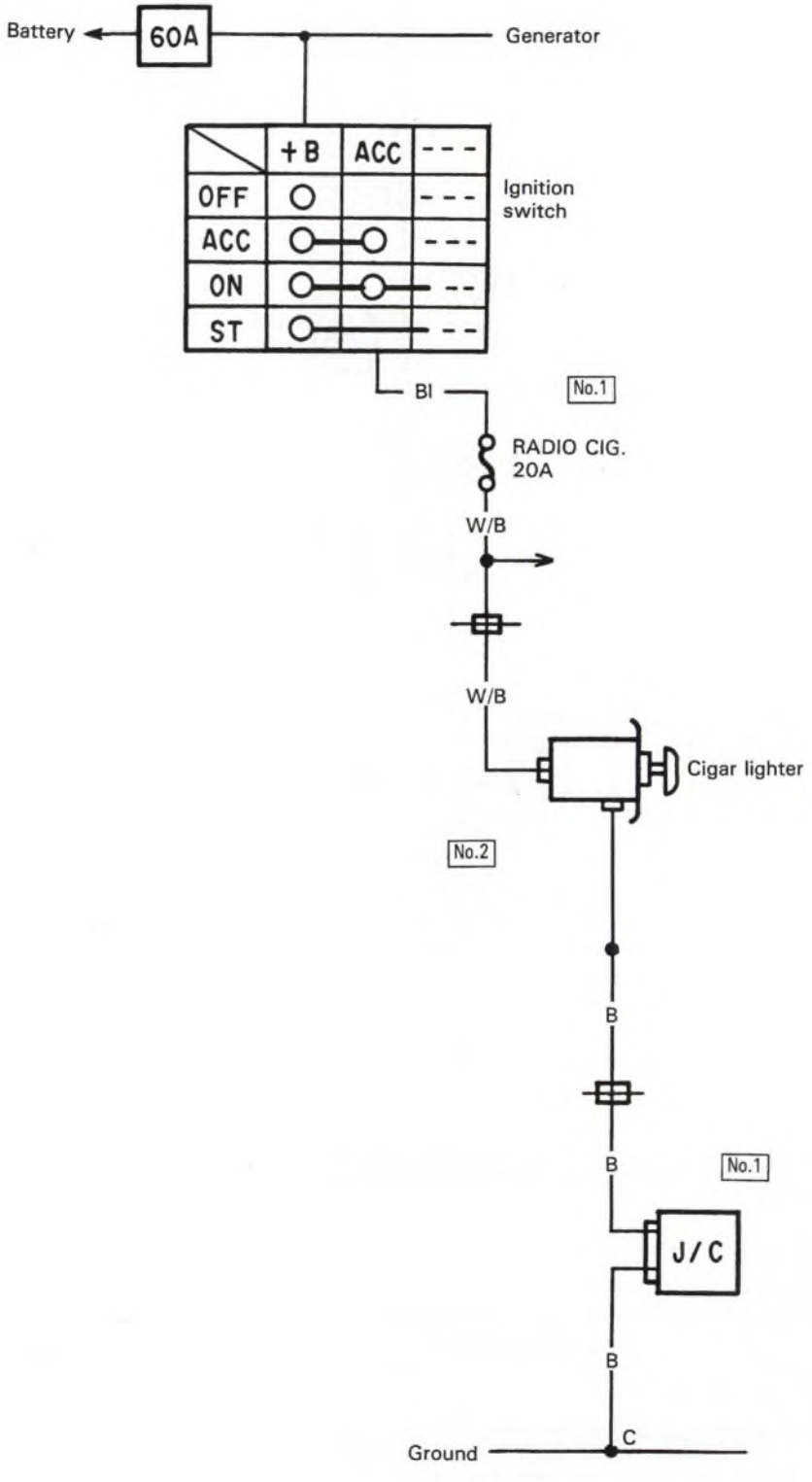
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Interior light does not light	• Fuse blown • Bulb burned out • Interior light switch faulty • Wiring or grounding faulty	• Replace fuse to check for short. • Replace. • Check switch. • Repair as necessary.

OTHER SYSTEM

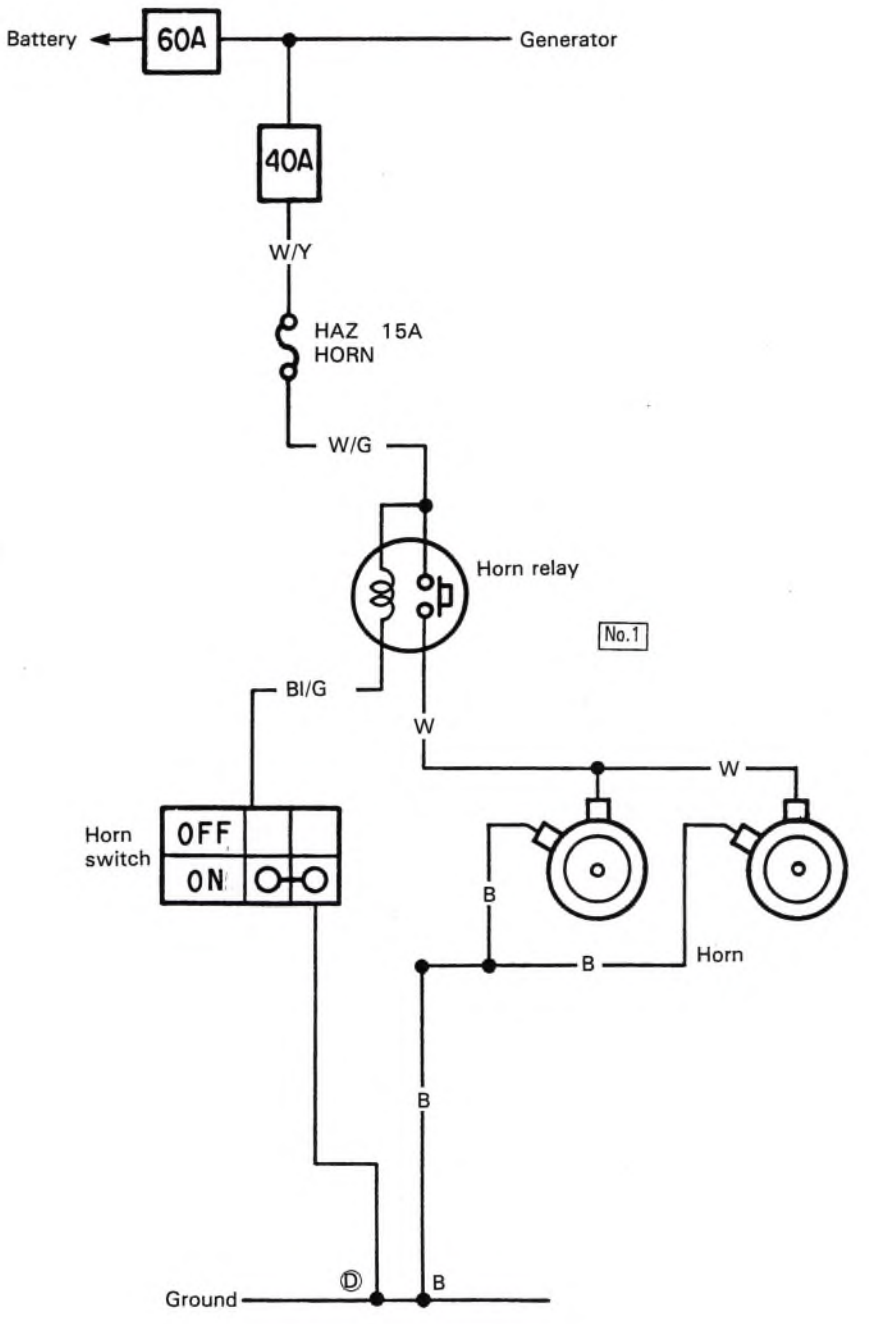
CIGAR LIGHTER

WIRING CIRCUIT

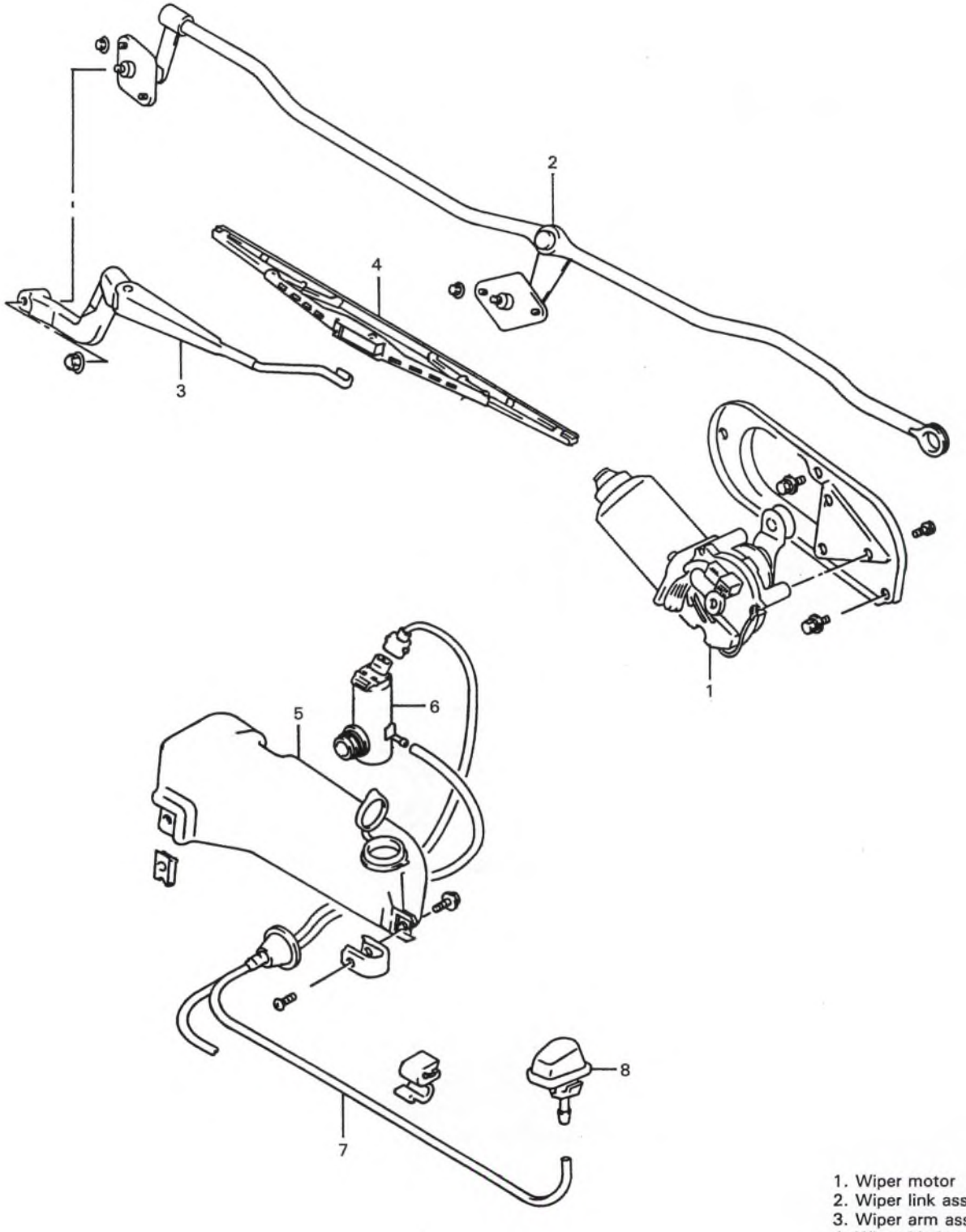


HORN

WIRING CIRCUIT

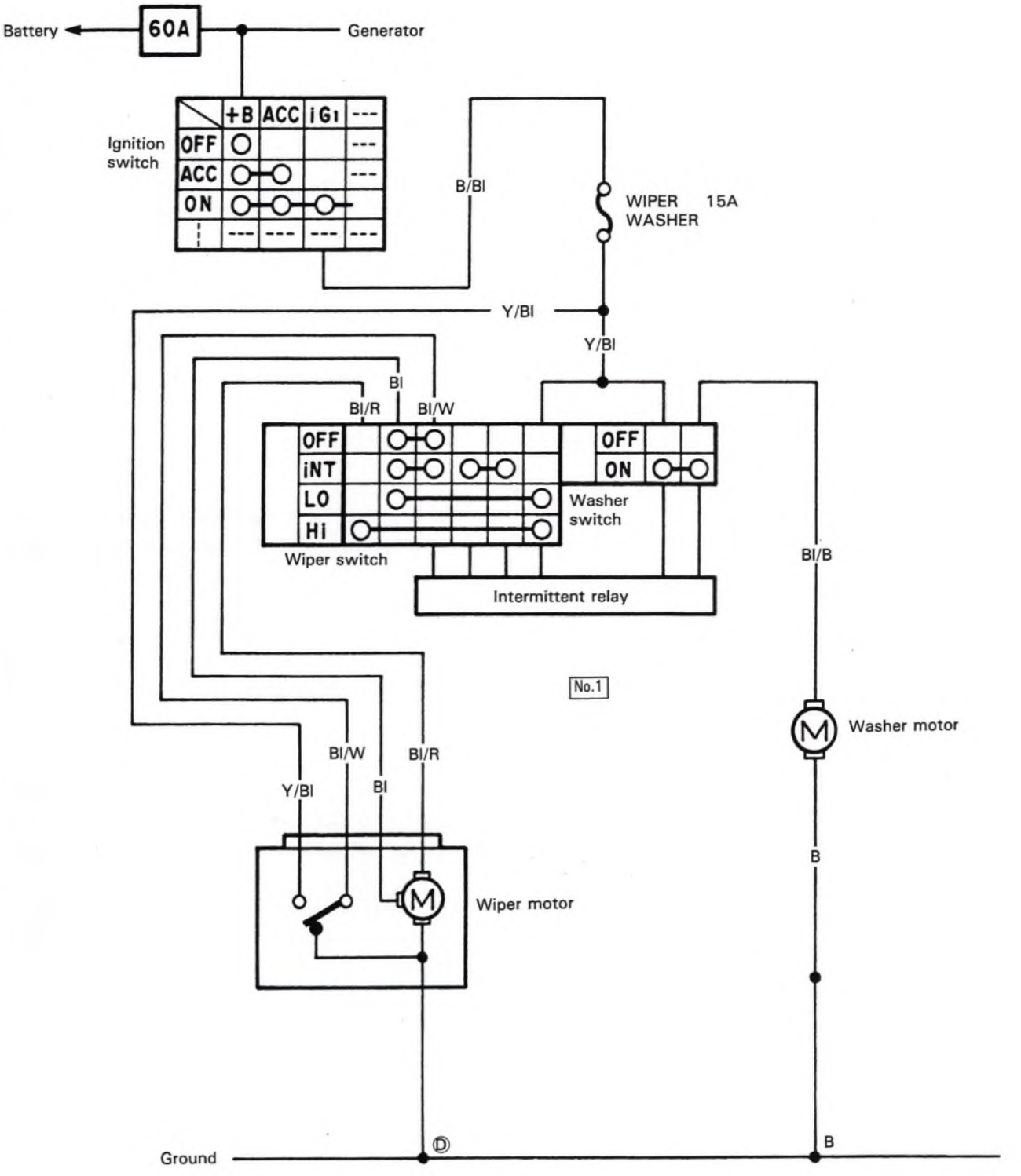


WINDSHIELD WIPER AND WASHER



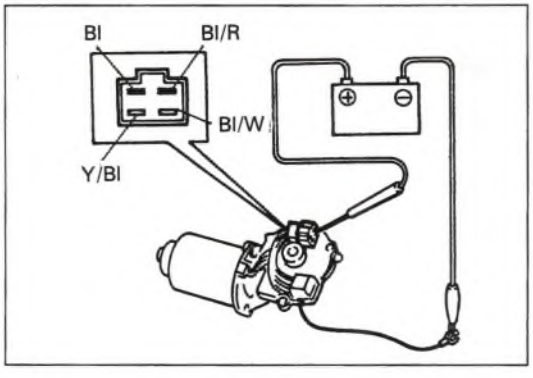
1. Wiper motor
2. Wiper link ass'y
3. Wiper arm ass'y
4. Wiper blade ass'y
5. Washer tank
6. Washer pump ass'y
7. Washer hose
8. Washer nozzle

WIRING CIRCUIT



TROUBLE DIAGNOSIS

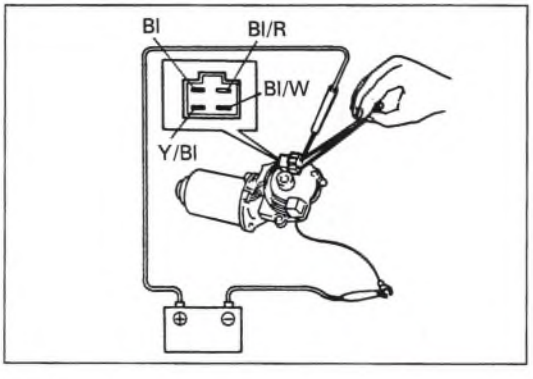
Trouble	Possible cause	Correction
Wiper malfunctions or does not return to original position	• Wiper fuse blown	• Replace fuse to check for short.
	• Wiper motor faulty	• Check motor.
	• Wiper control switch faulty	• Check switch.
	• Wiring or grounding faulty	• Repair.
Washer malfunctions	• Washer hose or nozzle clogged	• Repair.
	• Washer motor faulty	• Check motor.
	• Wiper control switch faulty	• Check switch.
	• Wiring faulty	• Repair.



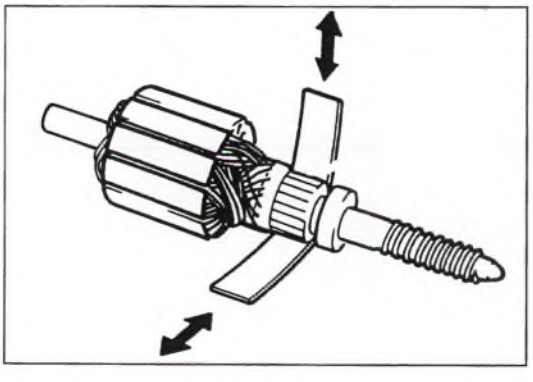
INSPECTION

WIPER MOTOR

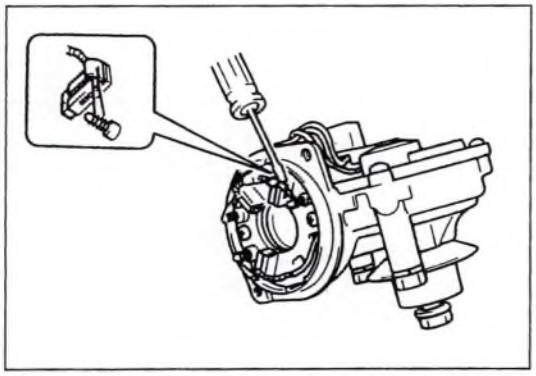
1) As illustrated left, use a 12 V battery to connect its (+) terminal to Blue terminal, and its (—) terminal to Black lead cord. If motor rotates at a low revolution speed of 45 to 55 rpm, it is proper. As for high speed check, connect battery (+) terminal to Blue/Red terminal, and its (—) terminal to Black lead cord. If motor rotates at a high revolution speed of 68 to 78 rpm, it is proper.



2) Testing automatic stop action
Connect battrey (+) terminal to motor Yellow/Blue terminal, and (—) terminal to Black lead cord, respectively. Use a jumper to short Blue/White and Blue terminals to each other to check whether motor shaft stops at a given position. This position must conform to start positon. Stop motor again and again with the jumper to confirm that it stops at the same position.

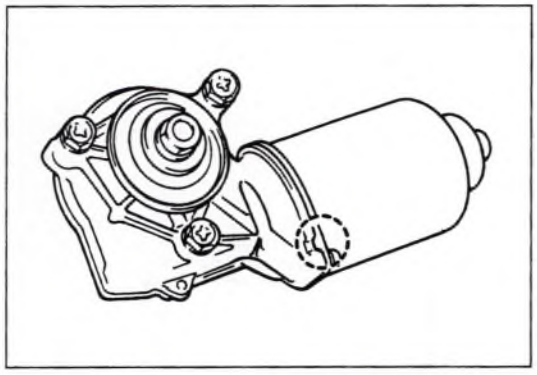


3) Checking brush and commutator
Use a circuit tester to check Blue terminal-to-Black lead cord continuity. If continuity is poor, check brush-to-commutator contact area for proper condition.
When the area is fouled, use a cloth wetted with gasoline to clean the area. When surface of the area is coarse or burnt, use a sandpaper to smooth it.

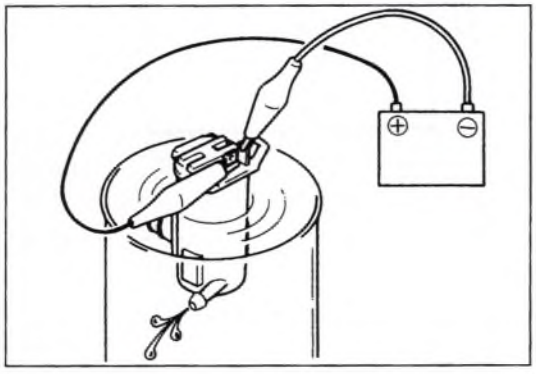


NOTE:

- **When reinstalling wiper motor, fit brush into each brush holder and hook brush lead wire around holder beforehand. After reinstalling it, release each brush.**



- **When installing wiper motor cover, be careful of its notch position to assemble it to specified position.**

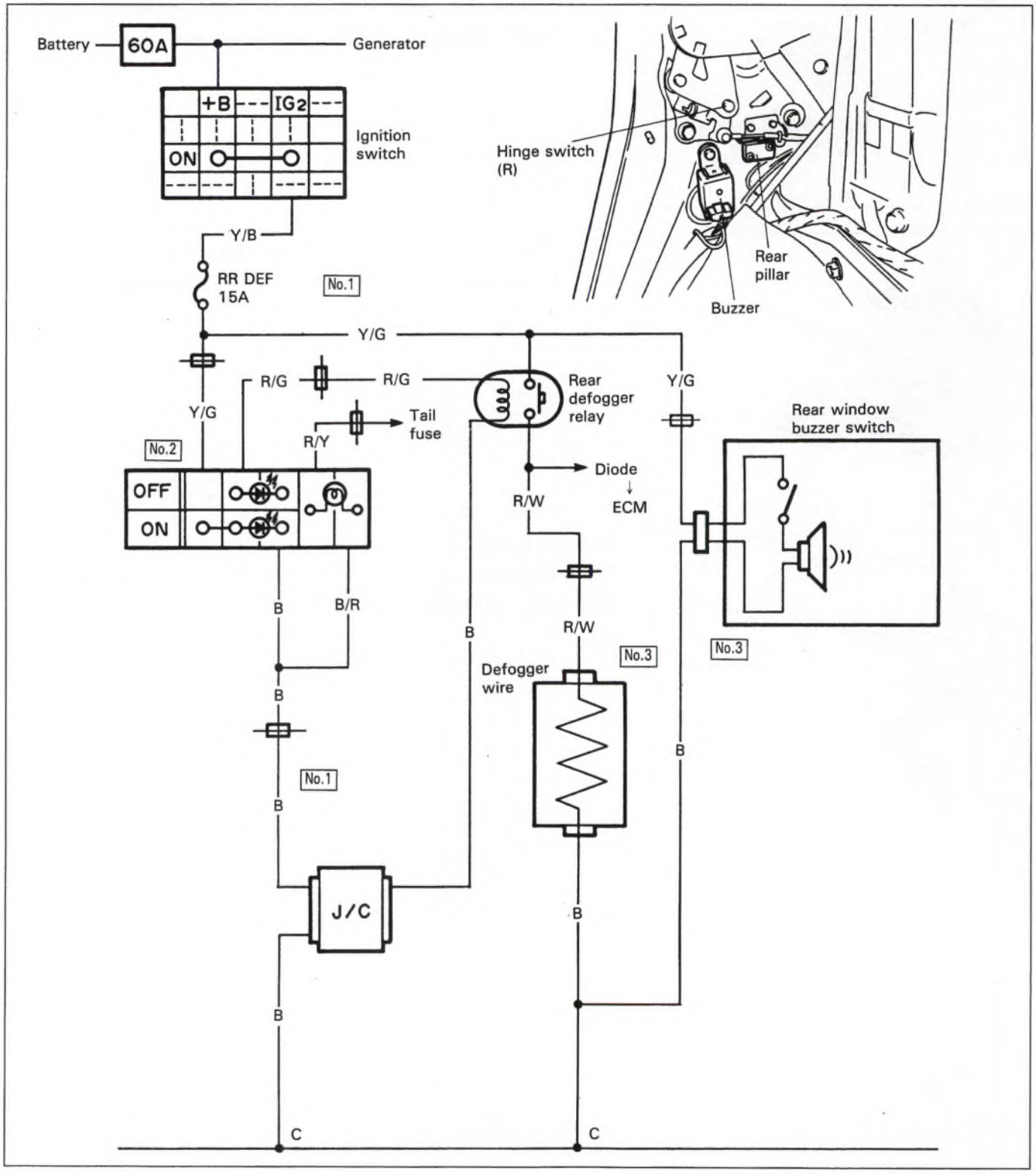


WASHER PUMP

Connect battery (+) and (—) terminals to pump (+) and (—) terminals respectively to check pumping rate.

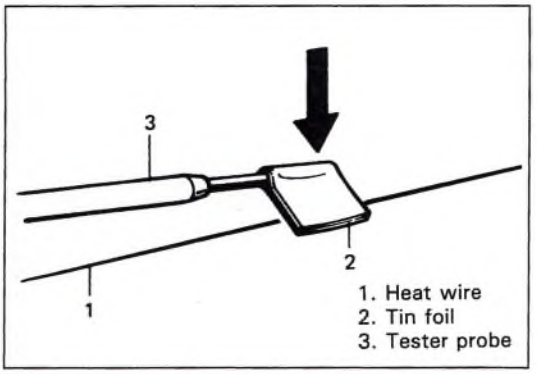
REAR WINDOW DEFFOGER

WIRING CIRCUIT



TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Defogger won't work	• Fuse blown • Defogger switch faulty • Defogger heat wire haulty • Wiring or grounding faulty	• Replace fuse to check for short. • Check switch. • Check heat wire. • Repair as necessary.

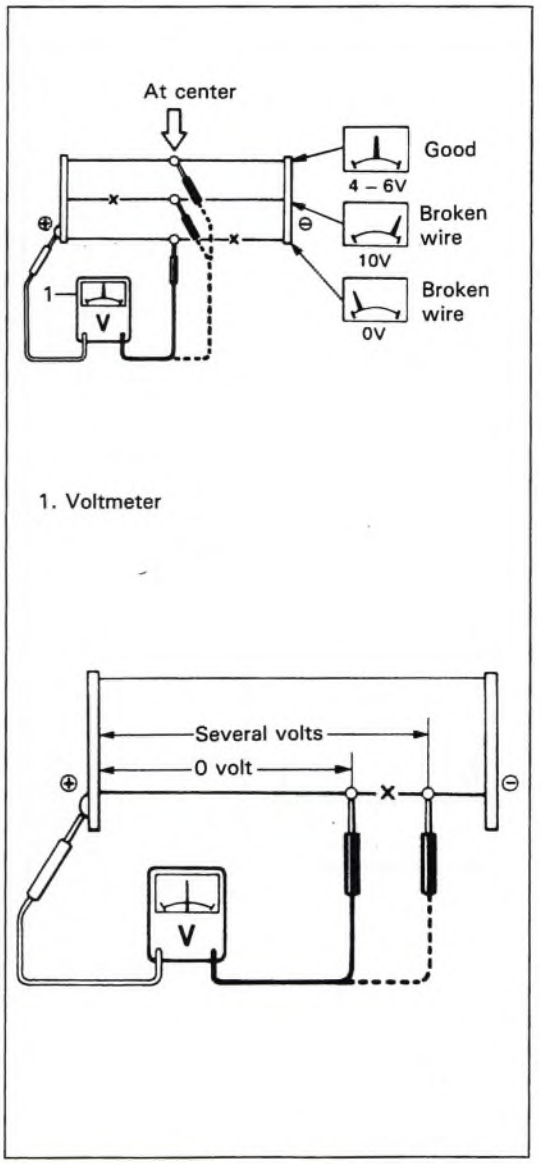


1. Heat wire
2. Tin foil
3. Tester probe

DEFOGGER WIRE

NOTE:

- **When cleaning rear window glass, use a dry cloth to wipe it along wire direction.**
- **When cleaning glass, do not use detergent or abrassive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with negative probe wrapped with a tin foil which should be held down on wire by finger pressure.**



1. Voltmeter

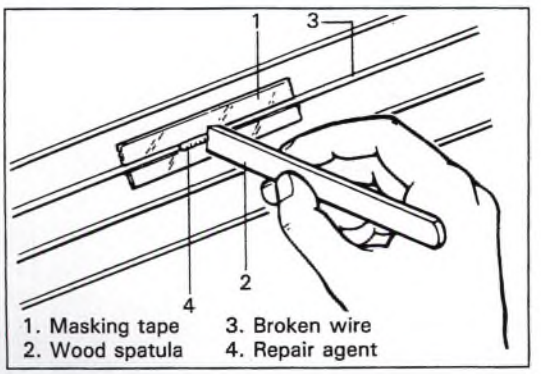
1) Checking wire damage
 a. Turn main switch ON.
 b. Turn defogger switch ON.
 c. Use a voltmeter to check voltage at the center of each heat wire, as shown.

Voltage	Criteria
Approx. 5V	Good (No break in wire)
Approx. 10V or 0V	Broken wire

If measured voltage is 10V, wire must be damaged between its center and positive end. If voltage is zero, wire must be damaged between its center and ground.

2) Locating damage in wire
 a. Touch voltmeter positive (+) lead to heat wire positive terminal end.
 b. Touch voltmeter negative (—) lead with a foil strip to heat wire positive terminal end, then move it along wire to the negative terminal end.
 c. The place where voltmeter fluctuates from zero to several volts is where there is damage.

NOTE:
If heat wire is free from damage, voltmeter should indicate 12V at heat wire positive terminal end and its indication should decrease gradually toward zero at the other terminal (ground).



1. Masking tape
2. Wood spatula
3. Broken wire
4. Repair agent

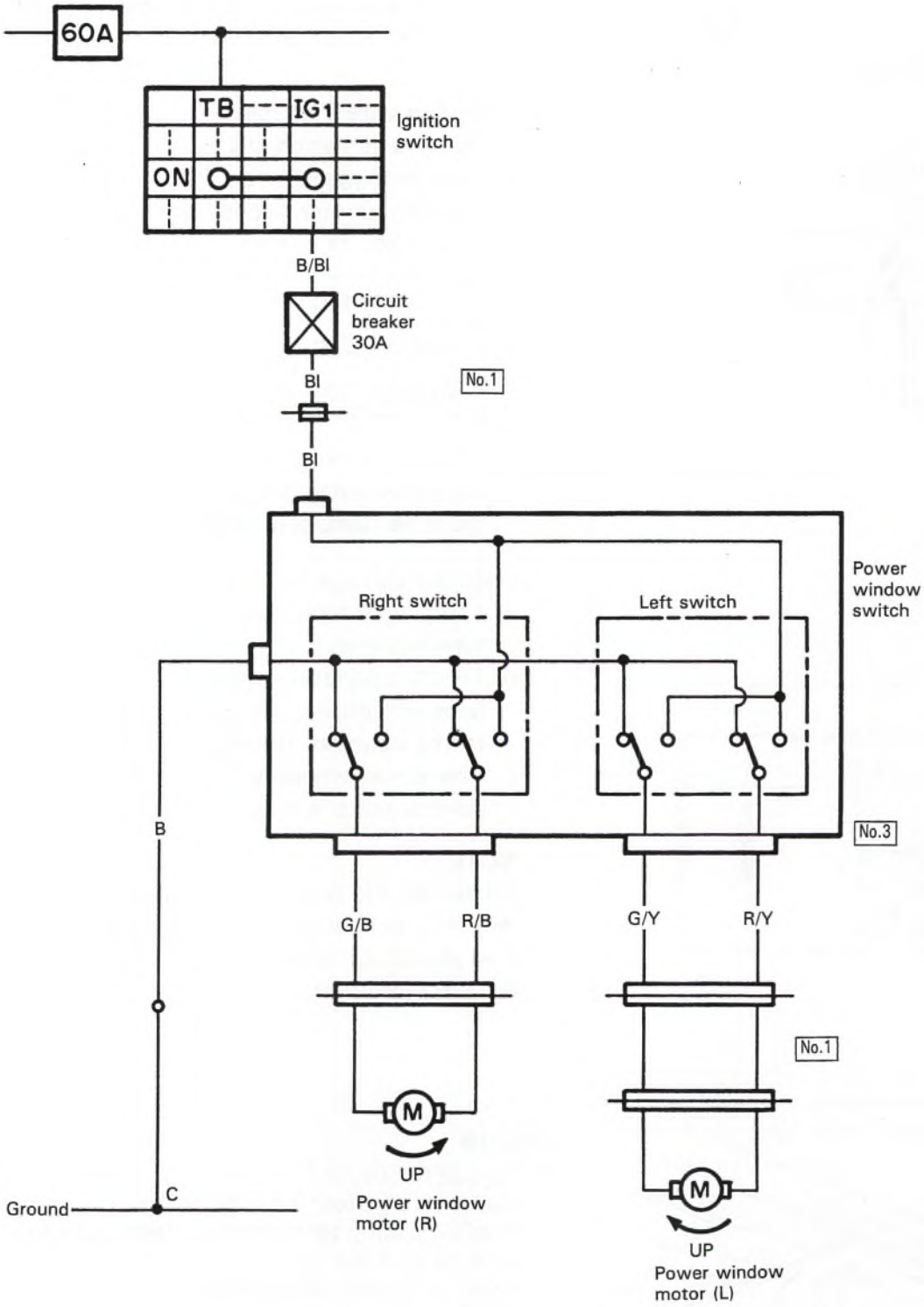
REPAIR

DEFOGGER CIRCUIT

1) Use white gasoline for cleaning.
2) Apply masking tape at both upper and lower sides of heat wire to be repaired.
3) Apply commercially-available repair agent with a fine-tip brush.
4) Two to three minutes later, remove masking tapes previously applied.
5) Leave repaired heat wire as it is for at least 24 hours before operating defogger again.

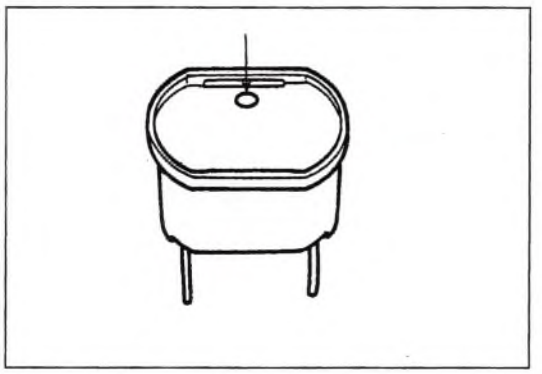
POWER WINDOW SYSTEM

WIRING CIRCUIT



TROUBLE DIAGNOSIS

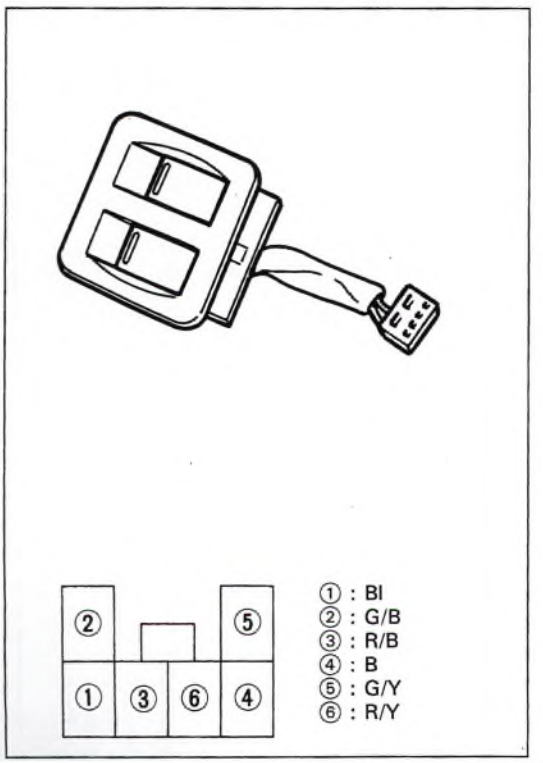
Trouble	Possible cause	Correction
All power window motors do not operate	• Open circuit by circuit breaker • Power window switch faulty • Wiring or grounding faulty	• Reset breakers. • Repair as necessary. • Repair as necessary.
Only one power window motor does not operate	• Power window switch faulty • Power window motor faulty • Wiring or grounding faulty	• Repair as necessary. • Repair as necessary. • Repair as necessary.



INSPECTION

BREAKER

When breaker has operated (circuit has opened), remove breaker at the left end of fuse box and push with a stick or the like inserted in hole at upper part or breaker till clicking is heard, and breaker can be reset.



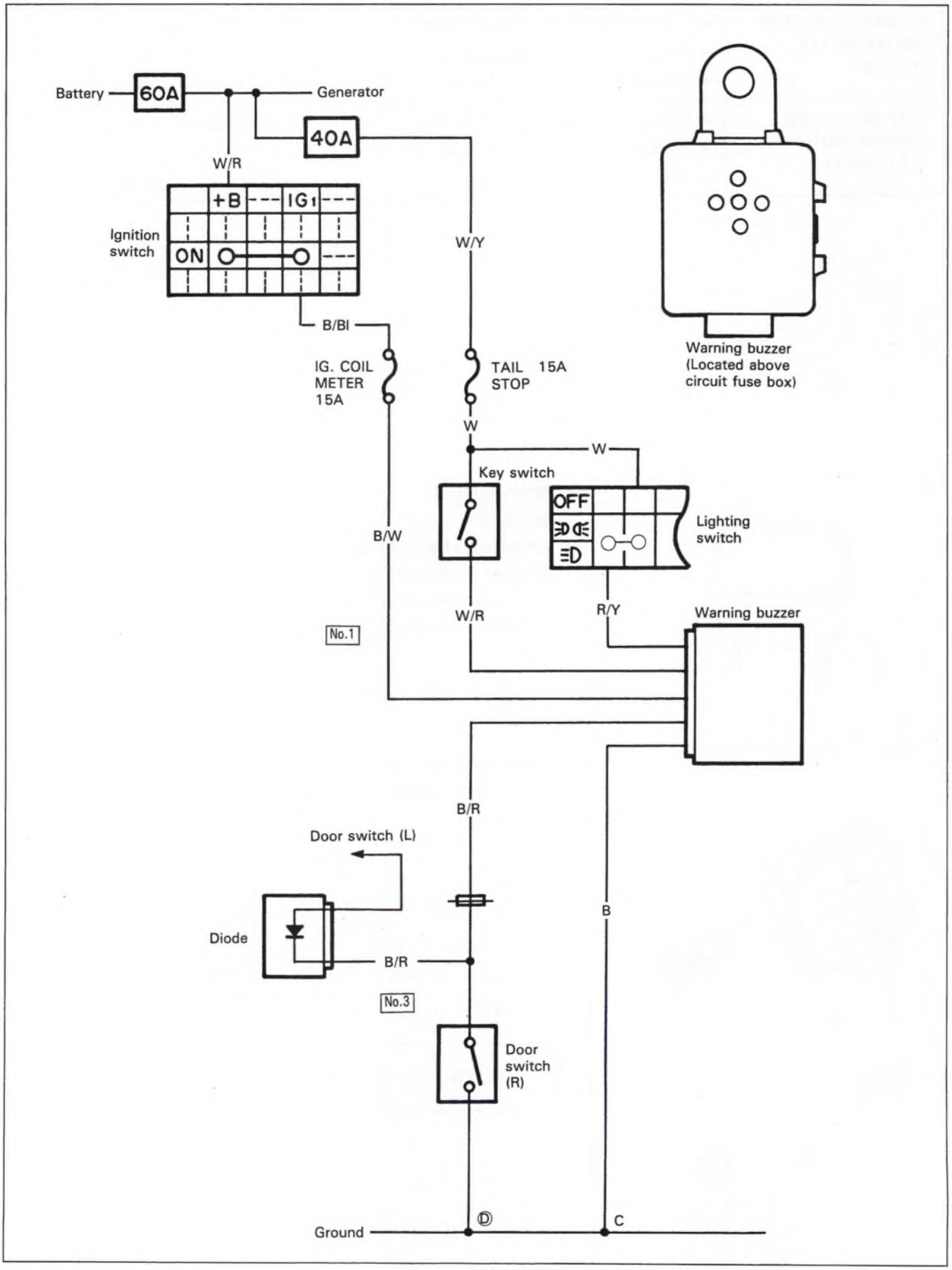
POWER WINDOW SWITCH

Use a circuit tester to check the continuity at each switch position.

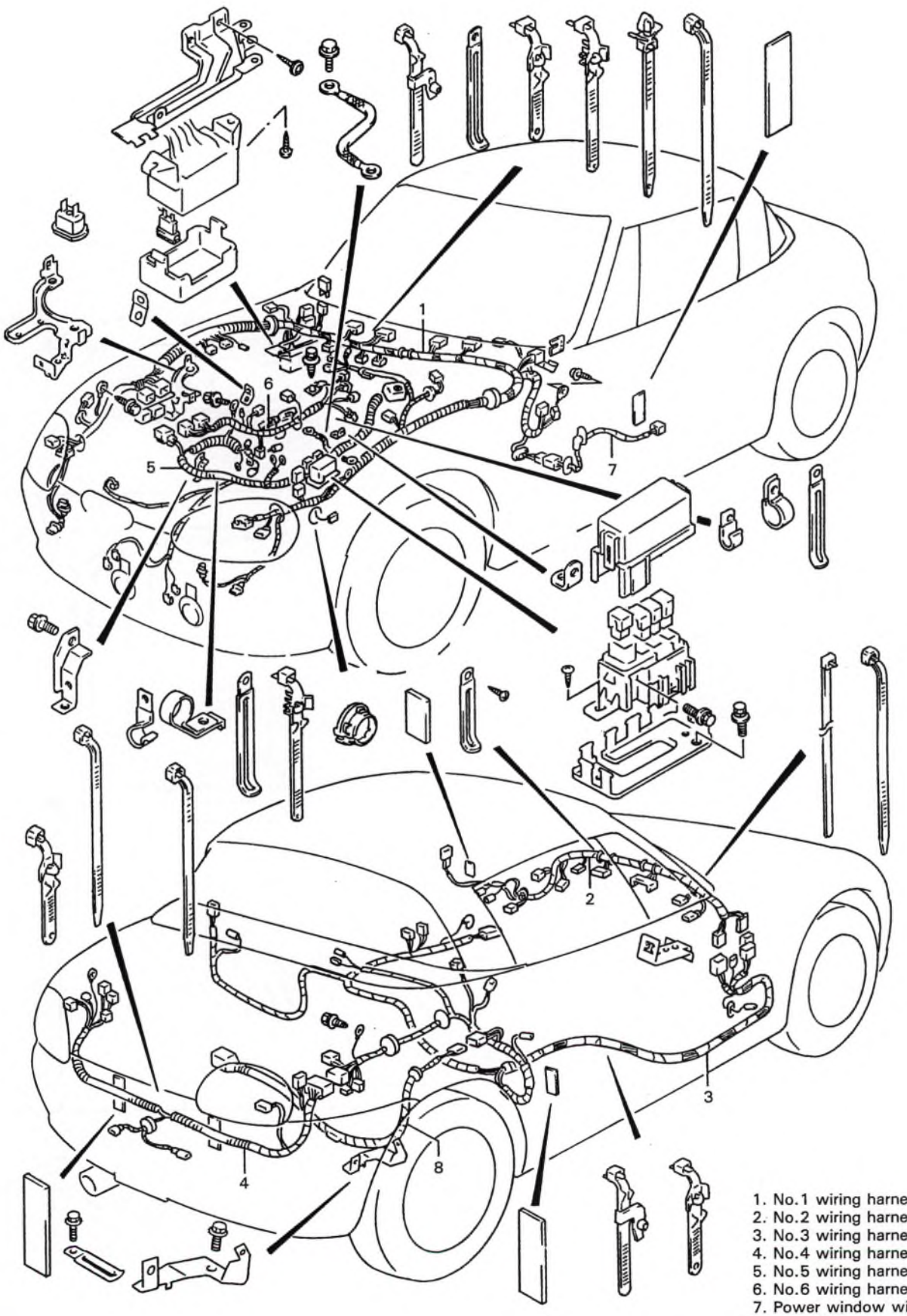
	Driver's side				Passenger's side			
	①	②	③	④	①	⑤	⑥	④
UP	○—○			○—○	○—○			○—○
OFF		○—○	○—○	○—○		○—○	○—○	○—○
DOWN	○—○		○—○		○—○		○—○	

KEY REMINDER WARNING BUZZER AND LIGHT REMINDER WARNING BUZZER

WIRING CIRCUIT

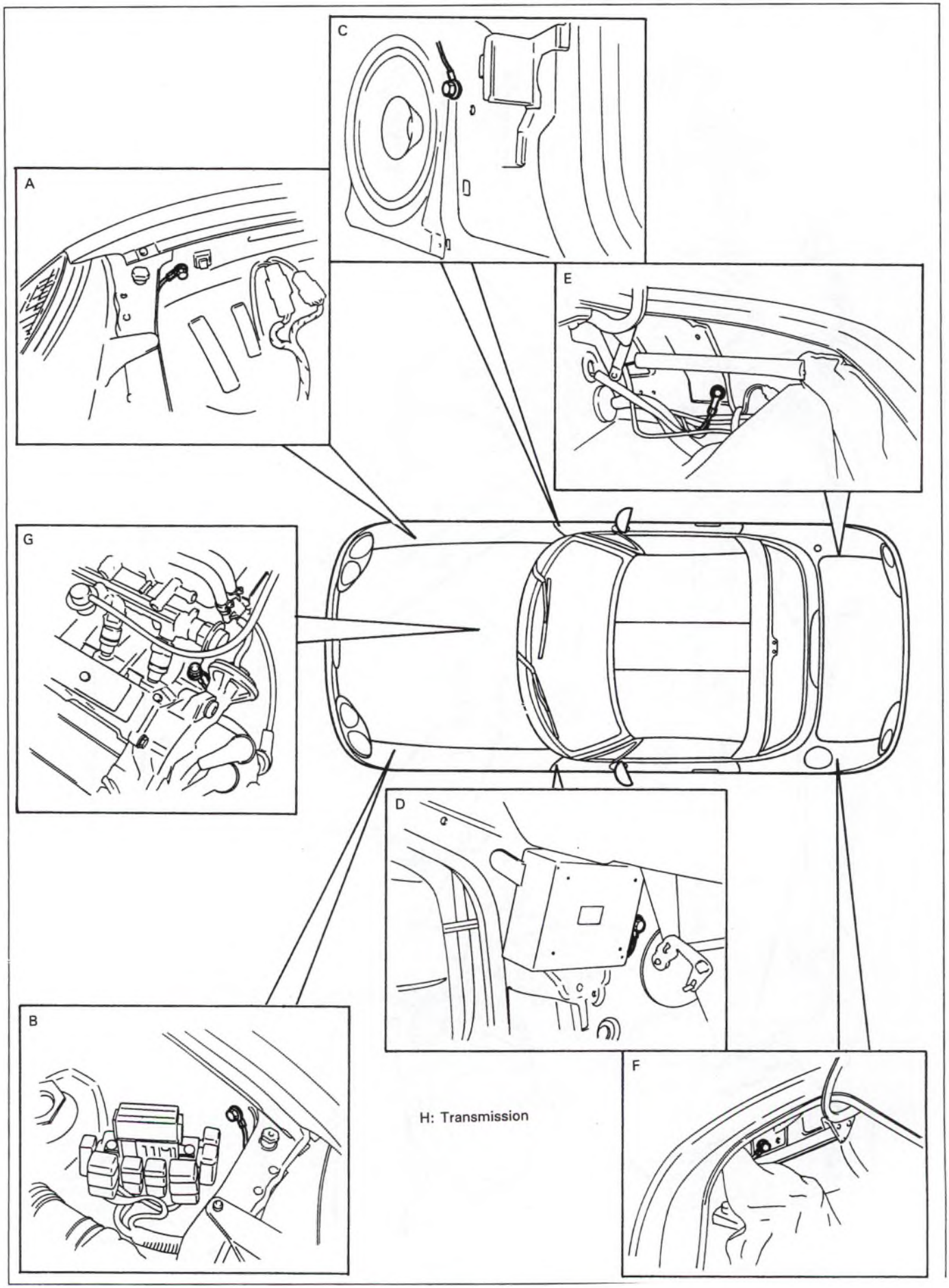


WIRING HARNESSES



1. No.1 wiring harness
2. No.2 wiring harness
3. No.3 wiring harness
4. No.4 wiring harness
5. No.5 wiring harness
6. No.6 wiring harness
7. Power window wire
8. VSS wire

GROUND POINTS



Ground	Circuit
A	Front position light (R), Front turn signal light (R), Side turn signal light (R), Brake fluid level switch
B	Front position light (L), Front turn signal light (L), Side turn signal light (L), Windshield washer motor, Horn (1), Horn (2), Headlight relay No.2, Radiator fan control relay
C	Turn signal relay, Heater fan switch, Ciger lighter, Heater control panel illumination, Rear defogger switch, Combination meter, Radio, Main relay, Combination switch, Ignition switch, Rear defogger relay, Fuel pump, A/C, Rear defogger ⊖, Seat belt switch, Power window switch, High mount stop light, Interior light switch, Rear window warning buzzer and switch, Vehicle speed sensor
D	Oxygen sensor
E	———
F	Rear combination light (R/L), Licence light, Back-up light
G	ECM
H	Combination meter

SECTION 9

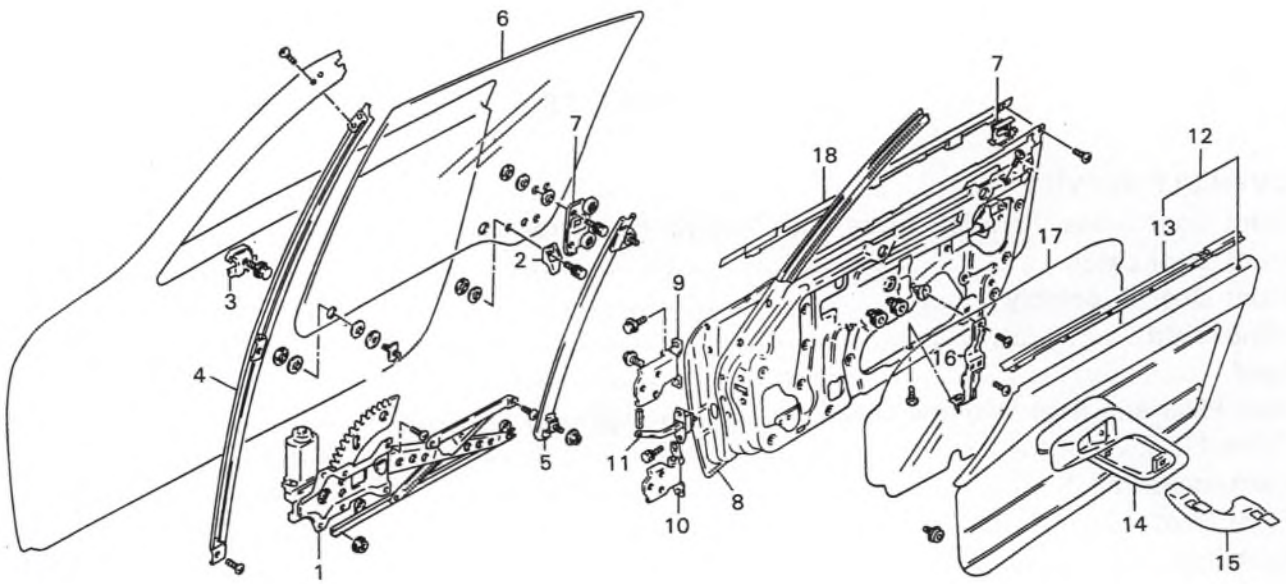
BODY SERVICE

CONTENTS

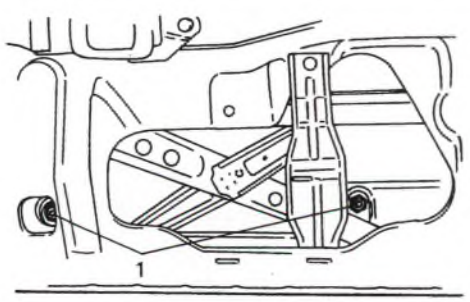
ON-VEHICLE SERVICE 9- 2
Front Door Glass, Partition Glass and Window Regulator 9- 2
Front Door Latch 9- 6
Front Door Assembly 9- 8
Windshield 9- 9
Roof 9-14
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BODY DIMENSIONS 9-21
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ON-VEHICLE SERVICE

FRONT DOOR GLASS, PARTITION GLASS AND WINDOW REGULATOR



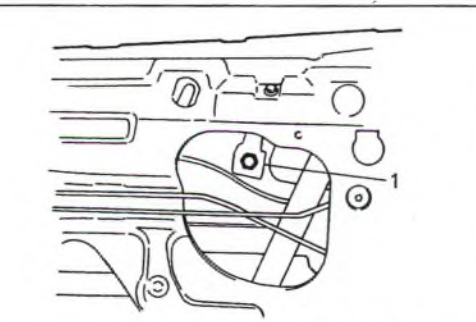
1. Regulator ass'y
2. Door glass stabilizer
3. Door glass up stop
4. Door center sash
5. Door rear sash
6. Door glass
7. Door trim support
8. Door panel ass'y
9. Door upper hinge
10. Door lower hinge
11. Door open stop
12. Door trim
13. Door inner weatherstrip
14. Door inside handle bezzel
15. Door grip
16. Door grip bracket
17. Door sealing cover
18. Door outer weather strip



1. Glass bottom channel fixing nut

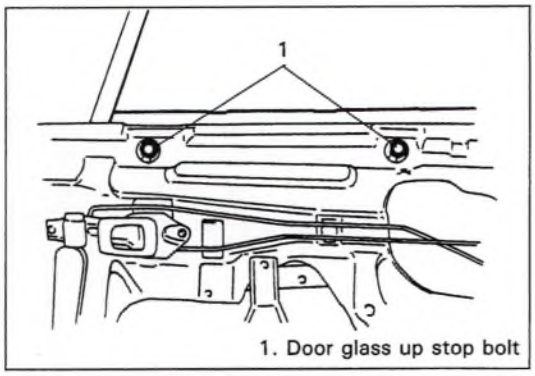
REMOVAL

1) Remove door trim and sealing cover, referring to above figure.
2) Remove outer weatherstrip.
3) Remove glass bottom channel fixing nuts.



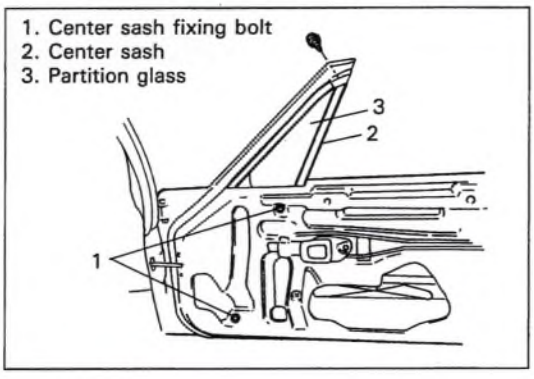
1. Door glass stabilizer

4) Remove door glass stabilizer with door glass lifted all the way up.

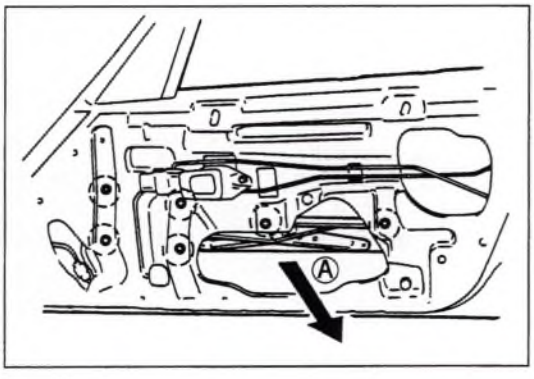


1. Door glass up stop bolt

5) Remove door glass up stops.
6) Take out door glass.
7) Remove door grip bracket.

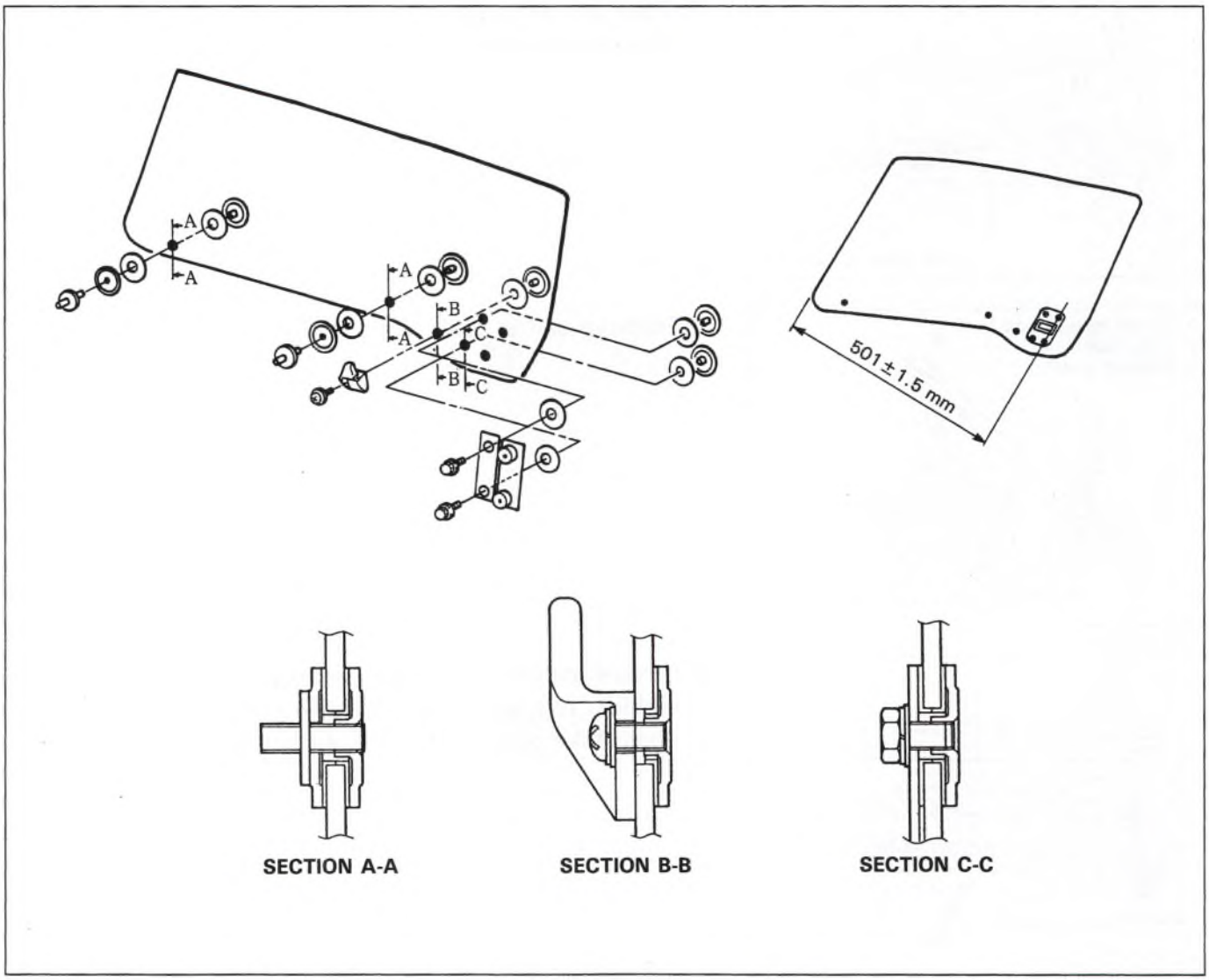


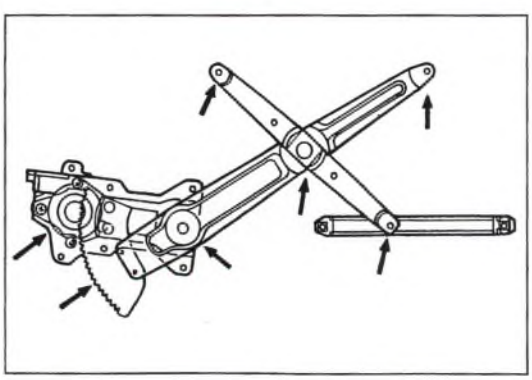
8) Remove center sash and partition glass.



9) Disconnect power window harness at coupler and remove window regulator fixing bolts (6 pcs.).
Then, take out regulator through hole Ⓐ.

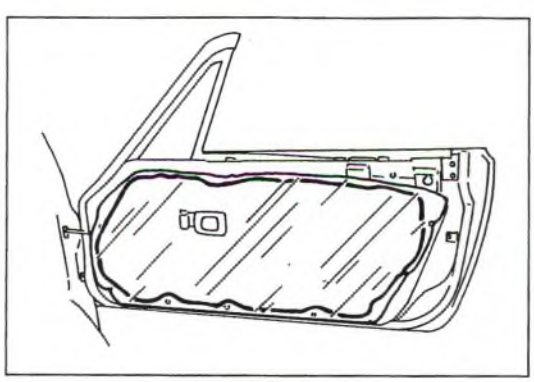
INSTALLATION





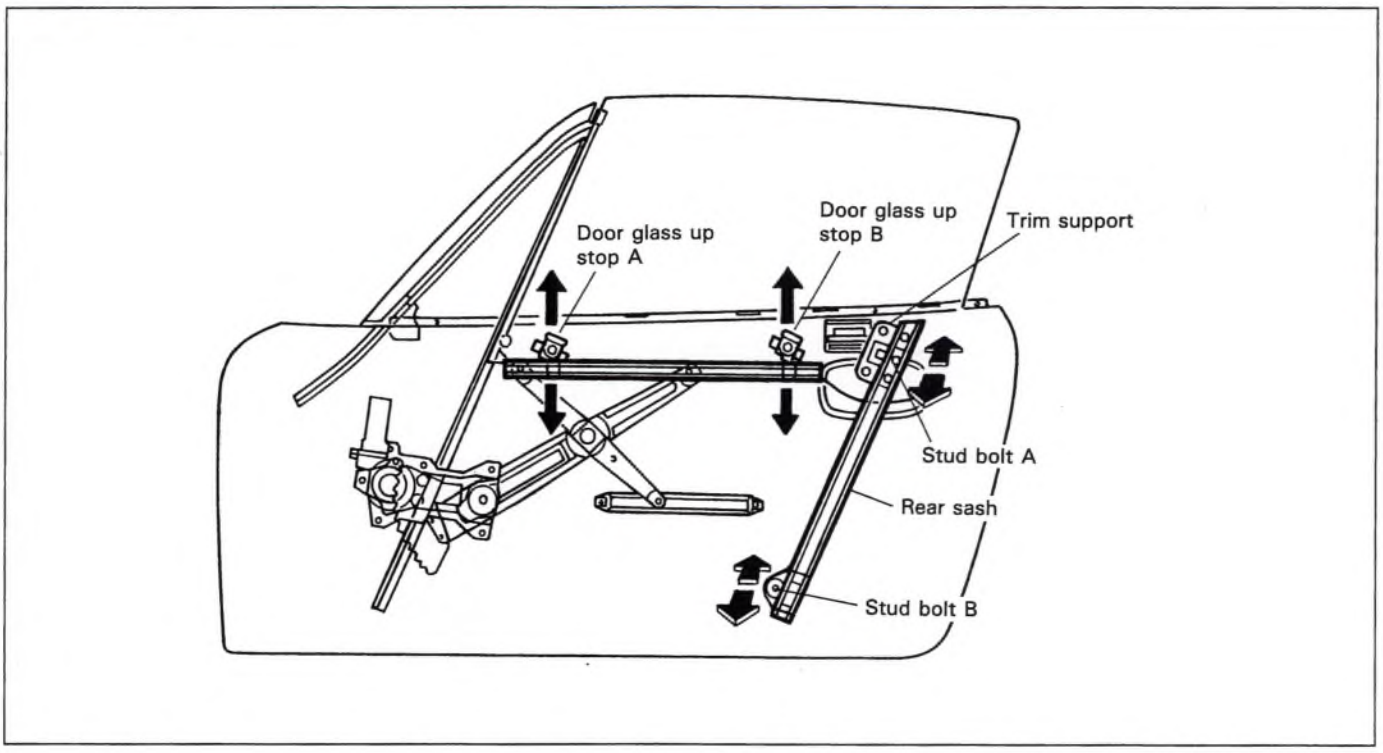
Install in reverse order of removal procedure, noting following point.

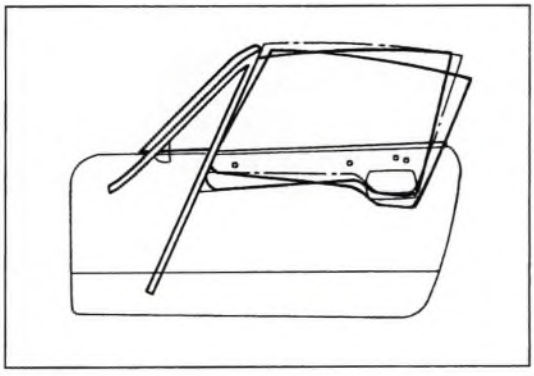
1) When replacing door glass, install parts as shown above.
2) Apply multi-purpose grease to sliding parts.



3) Securely seal door sealing cover with adhesive.

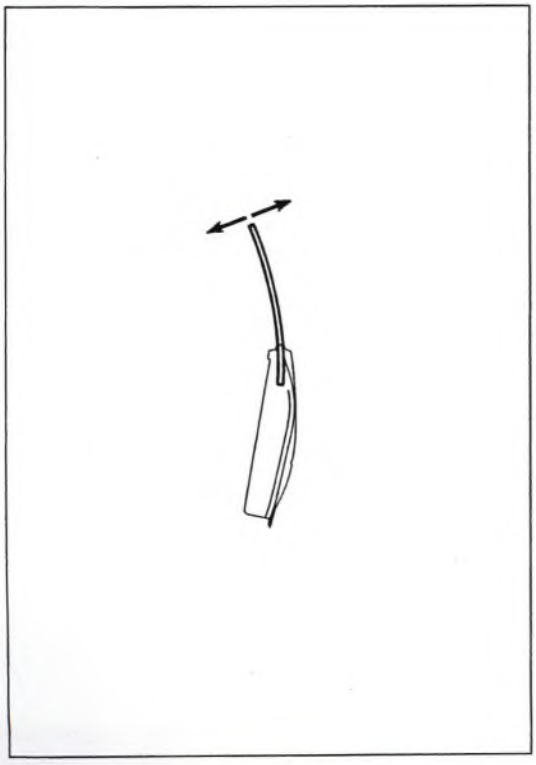
ADJUSTMENT





Up/Down Direction

1) When door glass is tilted forward or rearward, or height is not balanced, make up/down adjustment by using door glass up stops A and B.

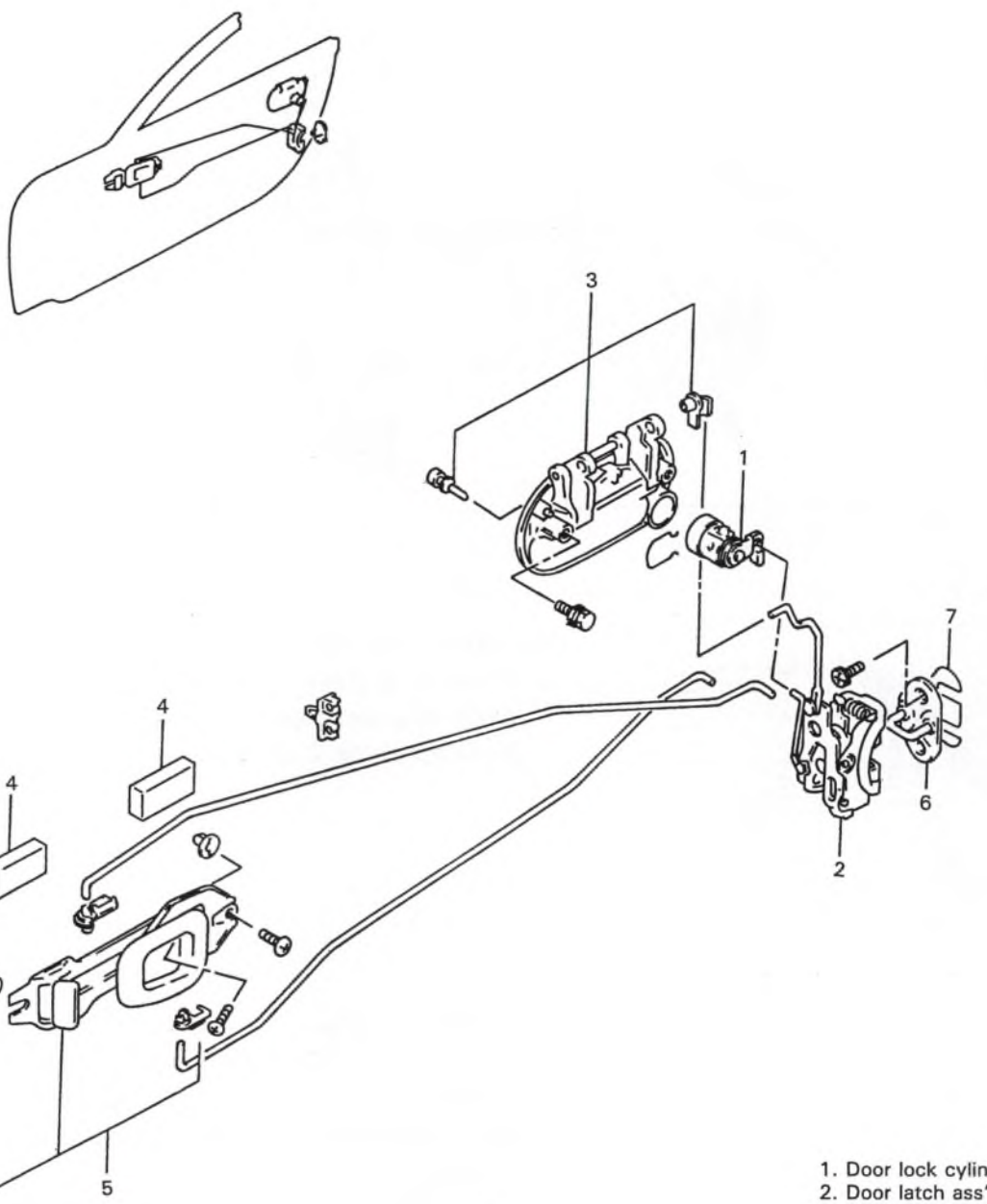


Right/Left Direction

1) Loosen fixing screws of trim support.
2) Move lower end of rear sash by adjusting stud bolt B.
3) Move upper end of rear sash by adjusting stud bolt A as necessary.
4) With door glass raised fully, tighten trim support fixing screws so that looseness of width direction can be absorbed.

NOTE:
Note that adjustment should be done mainly by using above Step 2) and Step 3) should be used for fine adjustment.

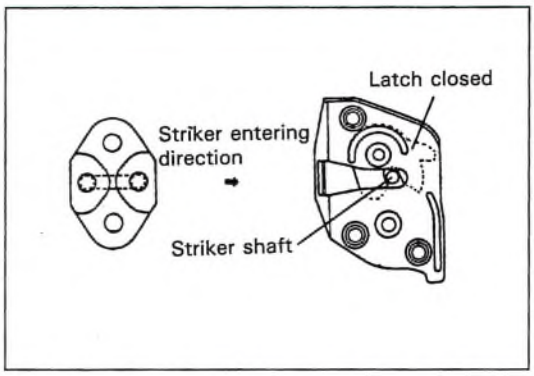
FRONT DOOR LATCH



1. Door lock cylinder set
2. Door latch ass'y
3. Outer handle
4. Inside handle pad
5. Inside handle
6. Door latch striker
7. Striker spacer

REMOVAL

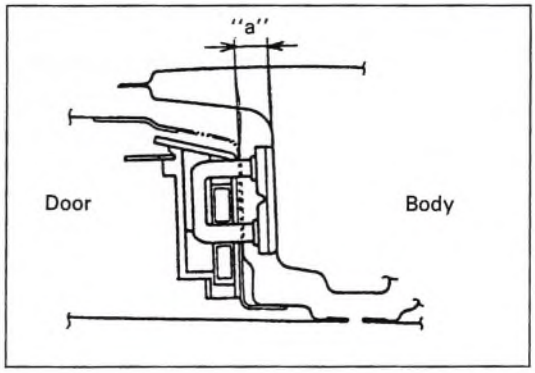
1) Remove door trim and sealing cover. (Refer to page 9-2.)
2) Remove door latch, referring to above figure.



INSTALLATION

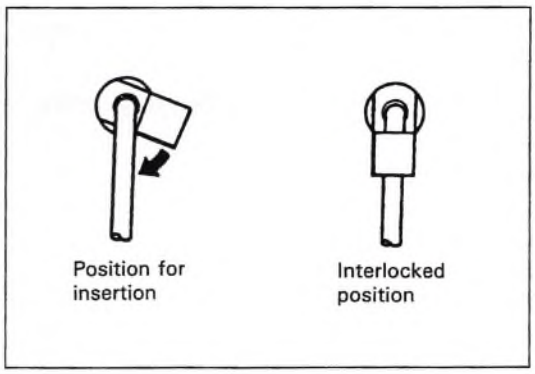
Install in reverse order of removal procedure, noting following points.

1) With respect to vertical position of striker, adjust so that it comes in the center position of door latch base.

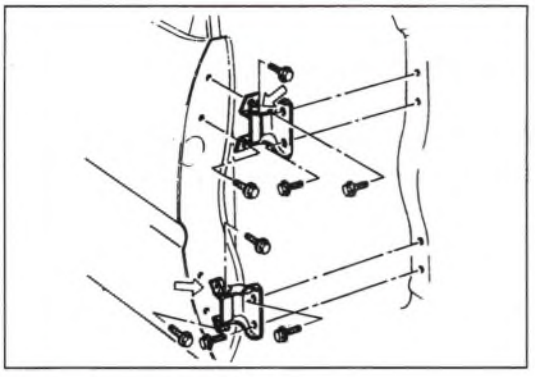


2) With respect to sideway position of striker, adjust so that door surface becomes flush with body surface.
3) With respect to height of striker, adjust by using a spacer so that clearance between door latch and striker satisfies below specified value.

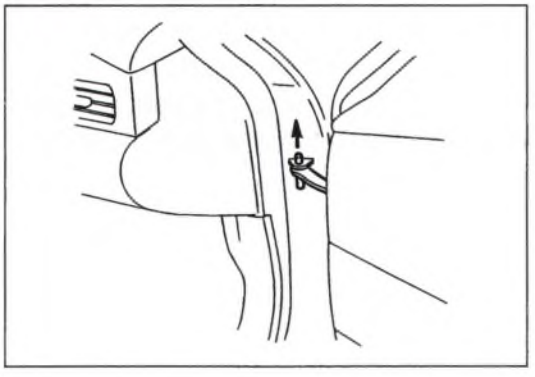
Specified clearance "a": 12—13 mm



4) When installing rods, insert each rod into holder and then turn holder.

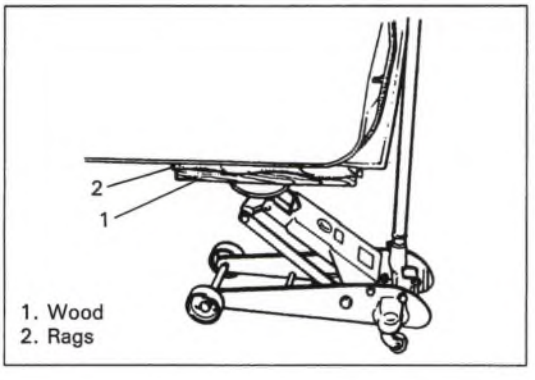


FRONT DOOR ASSEMBLY



REMOVAL

1) Remove stopper pin upward by tapping it with hammer.



1. Wood
2. Rags

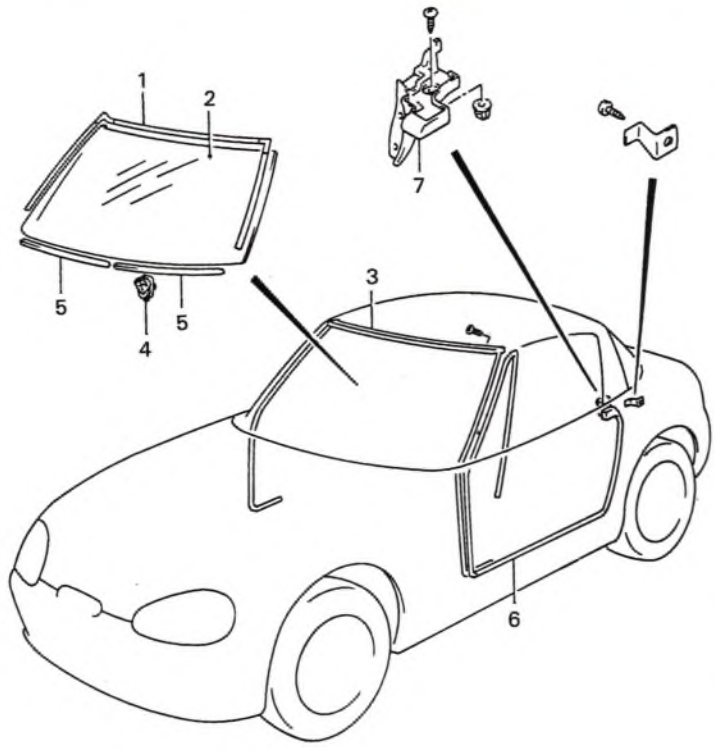
2) Using a jack, support door panel with a piece of wood placed between jack and panel.
3) Remove door ass'y by loosening hinge mounting bolts.

INSTALLATION

Install in reverse order of removal procedure, noting following point.

1) After installing, adjust door latch stricker position. (Refer to page 9-7.)

WINDSHIELD



1. Windshield molding
2. Windshield glass
3. Header opening weatherstrip
4. Glass stopper
5. Glass spacer
6. Door opening weatherstrip
7. Door opening up weatherstrip

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For windshield glass replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

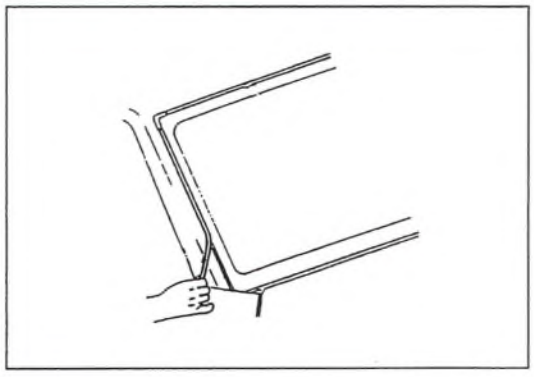
CAUTION:
Described here is the glass replacement by using one component urethane adhesive to be used with primer in combination. Each adhesive has its own drying and setting time and must be handled and used in a certain specific procedure. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.

Use an adhesive of above mentioned type which has following property.

Shearing strength: 40 kg/cm^2 or more

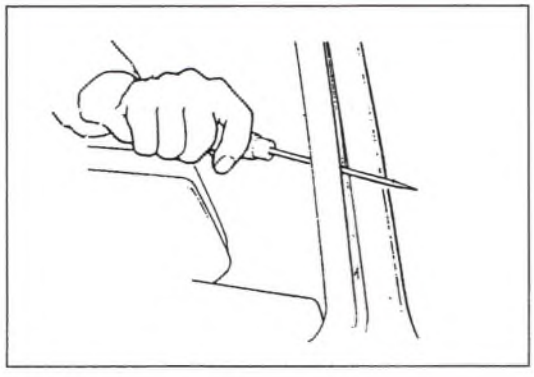
Adhesive materials and tools required for removal and installation.

- One component urethane adhesive and primers used in combination (For one sheet of windshield).
 Adhesive (600 g)
 Primer for glass (20 g)
 Primer for body (20 g)
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs.)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

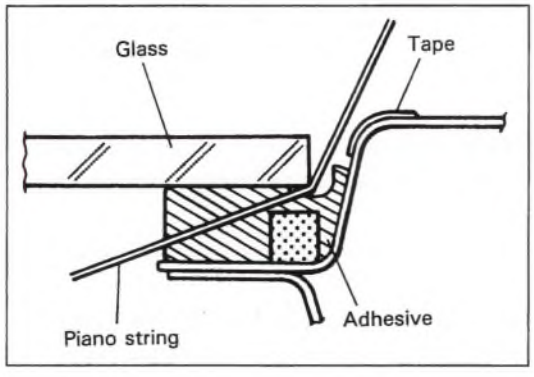


REMOVAL

1) Remove wiper arms, cowltop garnish, room mirror and trims around windshield.
2) Clean both inside and outside of glass and around it.
3) Remove windshield molding.
4) Using tape, cover body surface around front windshield to prevent any damage.

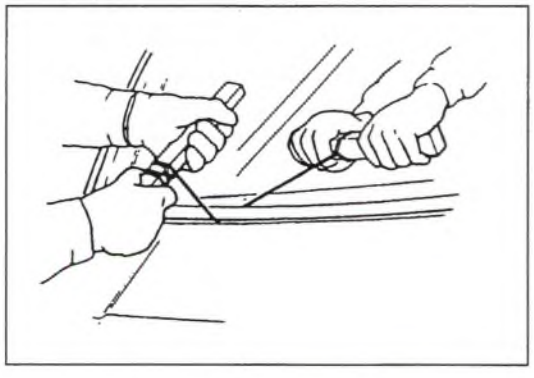


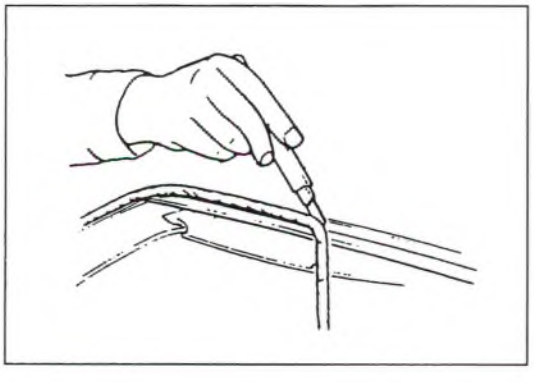
5) Drill hole with eyeleteer through adhered part and pass piano string through it.



6) Cut adhesive all around windshield with piano string.

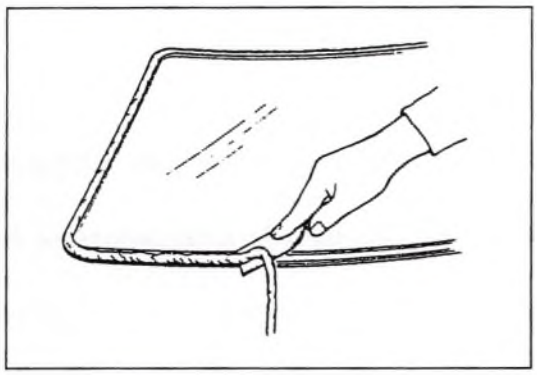
NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.



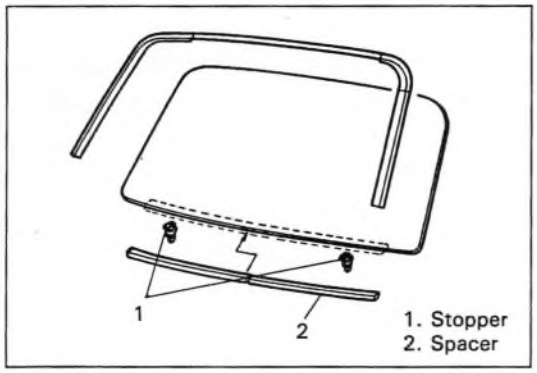


7) Using knife, smoothen adhesive remaining on body side so that it is 1 to 2 mm thick all around.

NOTE:
Before using knife, clean it with alcohol or the like to remove oil from it.

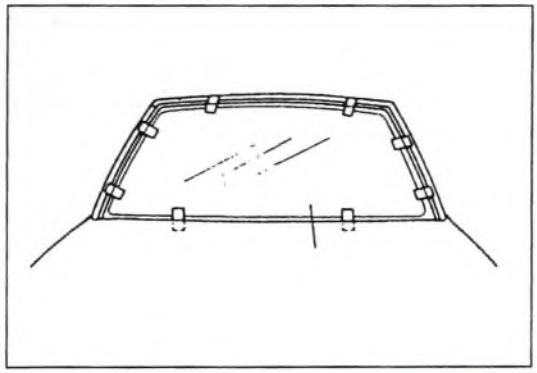


8) When re-using windshield, remove the adhesive from it, using care not to damage primer coated surface.

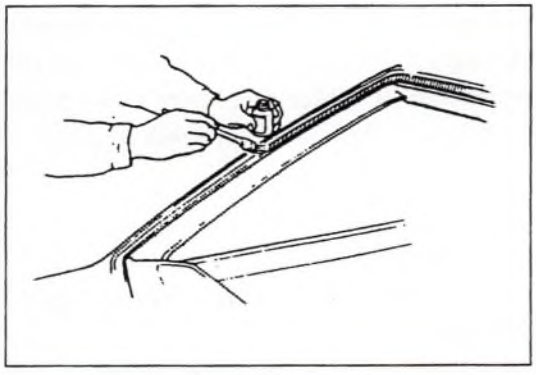


INSTALLATION

1) Using cleaning solvent, clean windshield edge where windshield glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install windshield molding to glass.
3) Install stopper and spacer.

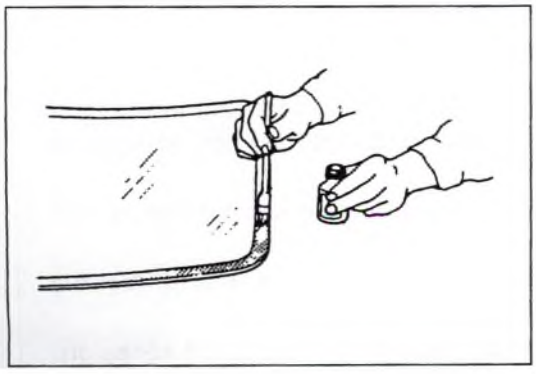


4) Place windshield glass so that even clearance is provided between top and bottom, and right and left and make match marks on glass and body as shown in figure.



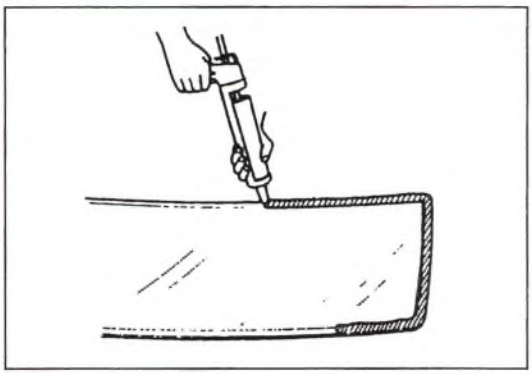
5) Using new brush, apply sufficient amount of primer for body along body surface where windshield glass is to be adhered.

NOTE:
Be sure to refer to maker's instruction for proper handling and drying time.



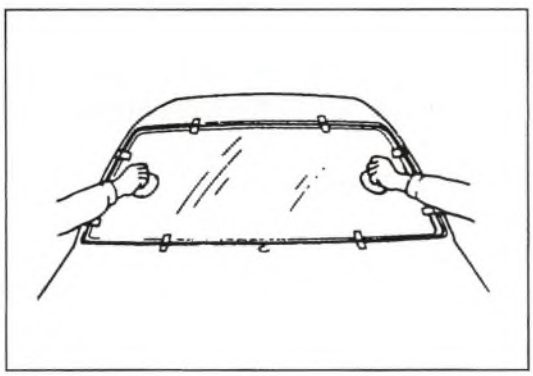
6) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to body.

NOTE:
- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not touch primer coated surface.**

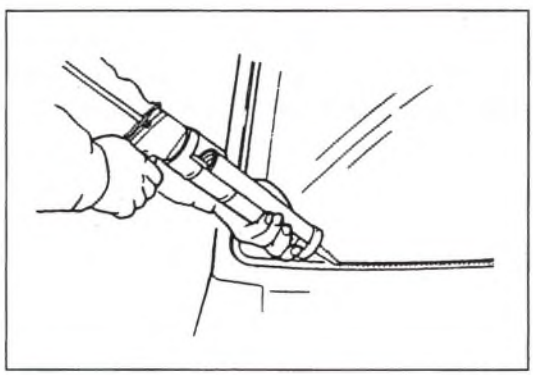


7) Apply adhesive along glass edge.

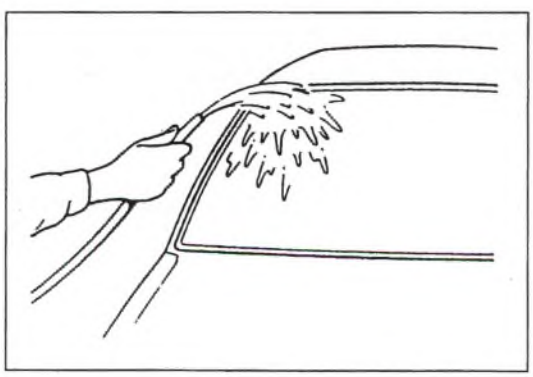
NOTE:
- **Start from bottom side of glass.**
- **Adhesive should be applied evenly especially in height.**
- **Be careful not to damage primer.**
- **Press glass against body quickly after adhesive is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive is applied.**



8) Peel remaining paper from trim.
9) Holding rubber sucker grips, place glass onto body by aligning mating marks marked in step 4) and press it.



10) Replace cartridge nozzle with mending nozzle and fill adhesive into underfilled part. Where adhesive is overfilled, remove excess. Also wipe off adhesive on body and glass, it any, with cleaning solvent.

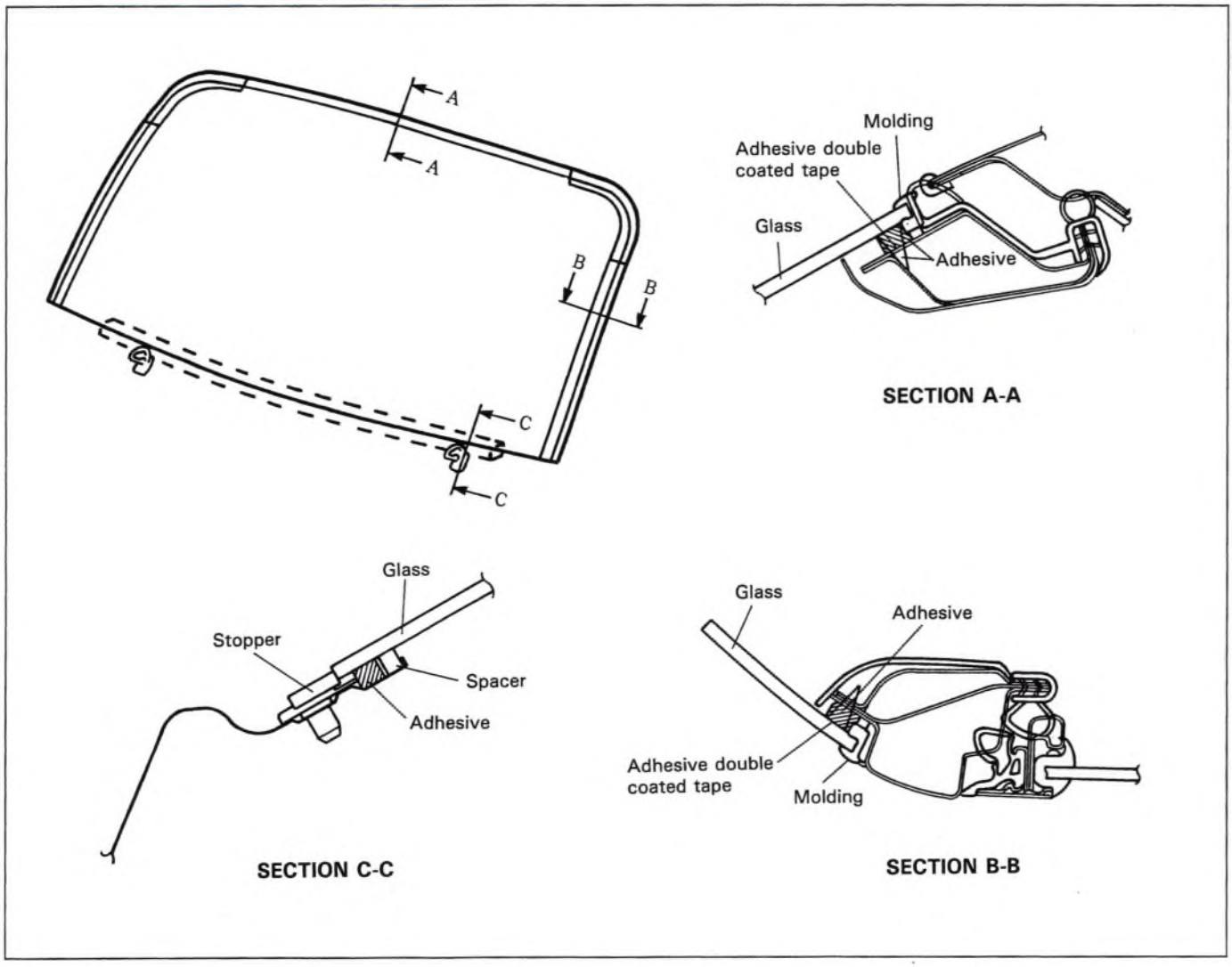


11) Check for water leakage by pouring water over windshield through hose. If leakage is found, dry windshield and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

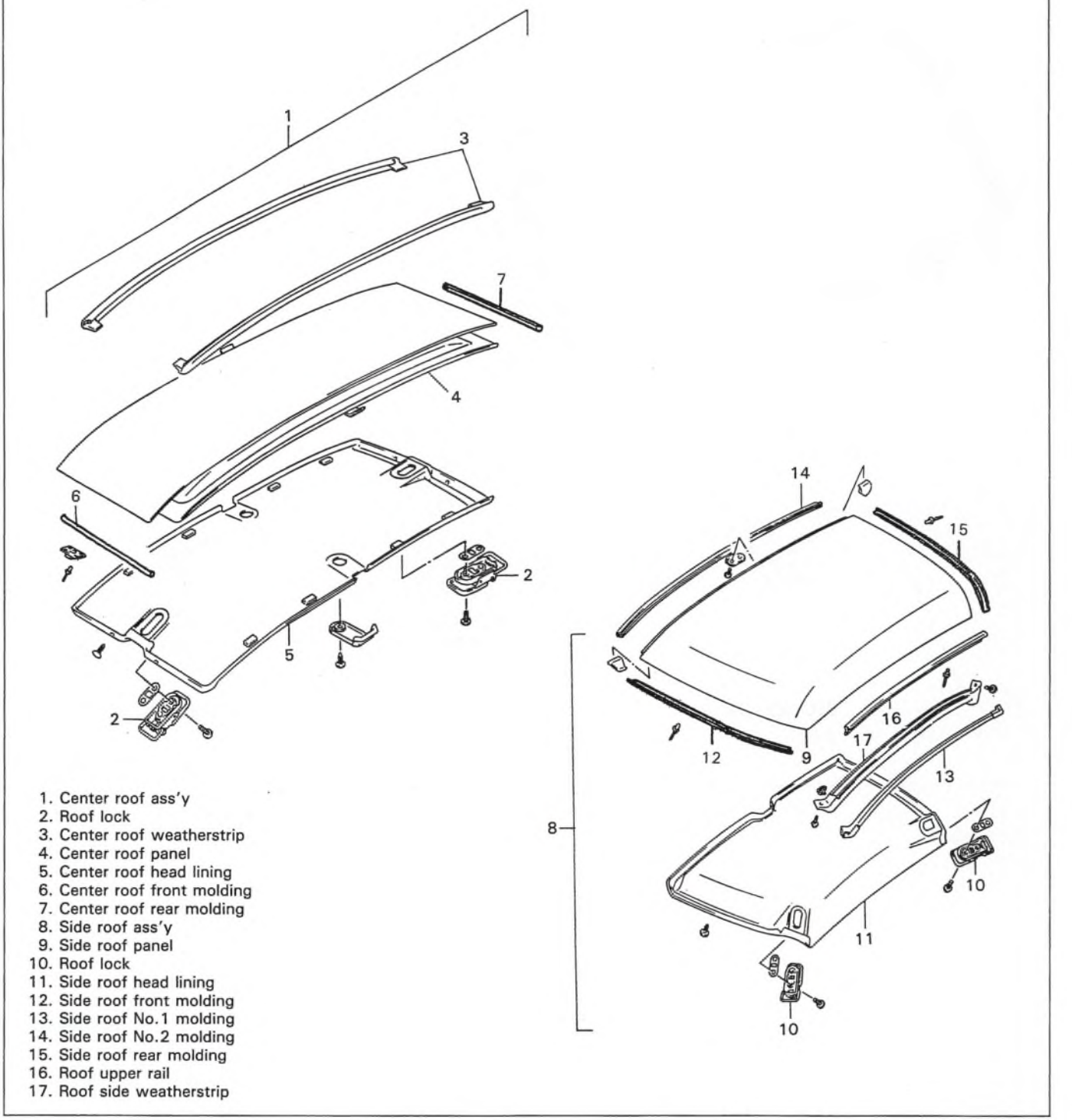
NOTE:
- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or the like for drying.**

CAUTION:
Upon completion of installation, note the following.
- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If molding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time.**
 Be sure to refer to maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.
- **Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

Sectional Drawing of Windshield Glass Installed in Place

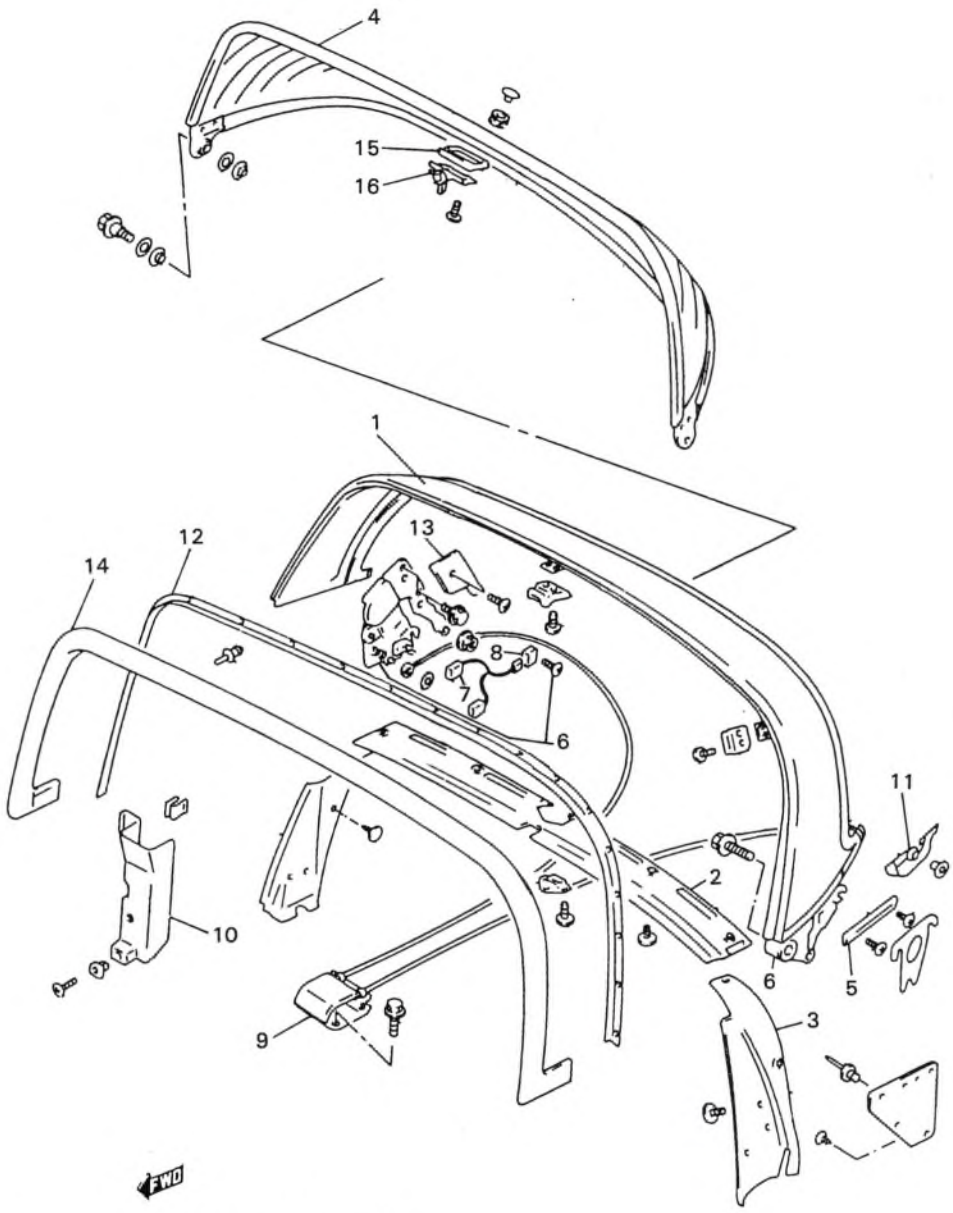


ROOF

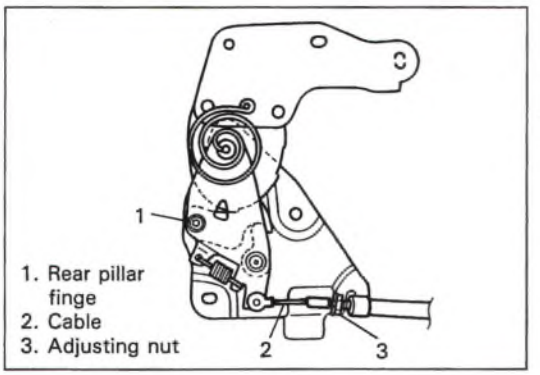


1. Center roof ass'y
2. Roof lock
3. Center roof weatherstrip
4. Center roof panel
5. Center roof head lining
6. Center roof front molding
7. Center roof rear molding
8. Side roof ass'y
9. Side roof panel
10. Roof lock
11. Side roof head lining
12. Side roof front molding
13. Side roof No.1 molding
14. Side roof No.2 molding
15. Side roof rear molding
16. Roof upper rail
17. Roof side weatherstrip

REAR PILLAR AND REAR WINDOW GLASS



1. Rear pillar outer panel
2. Rear pillar inner center trim
3. Rear pillar inner side trim
4. Back window glass
5. Rear pillar lower weatherstrip
6. Rear pillar hinge
7. Limiter switch
8. Buzzer
9. Rear pillar release lever
10. Quarter inner weatherstrip
11. Window hinge weatherstrip
12. Rear pillar upper rail
13. Back window hinge cover
14. Rear pillar opening weatherstrip
15. Lock spacer
16. Back window lock



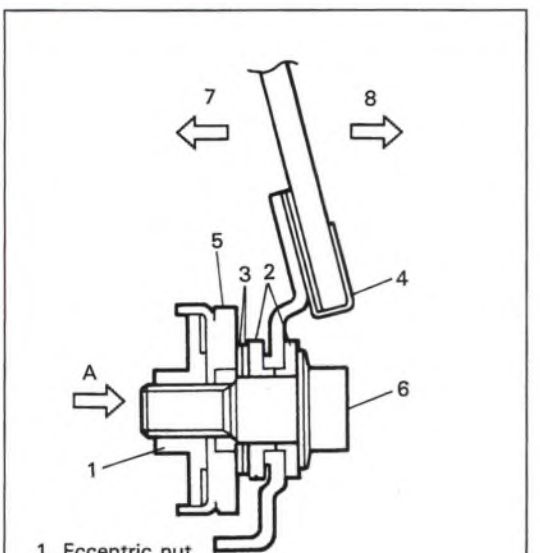
1. Rear pillar finge
2. Cable
3. Adjusting nut

ADJUSTMENT

Rear Pillar Control Cable

To make adjustment of rear pillar control cable, turn adjusting nut on rear pillar hinge so that specified cable play is obtained.

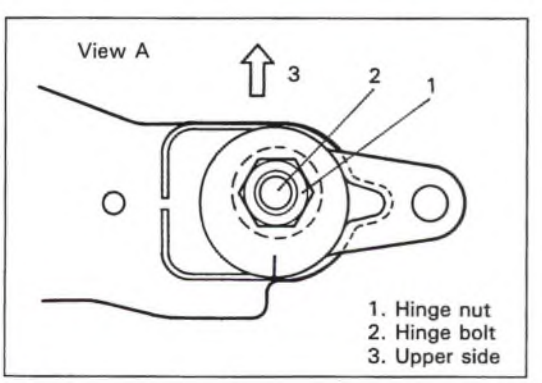
Cable play: 1—2 mm



1. Eccentric nut
2. Spacer
3. Washer
4. Back window
5. Hinge
6. Hinge bolt
7. Inside
8. Outside

Back Window Hinge

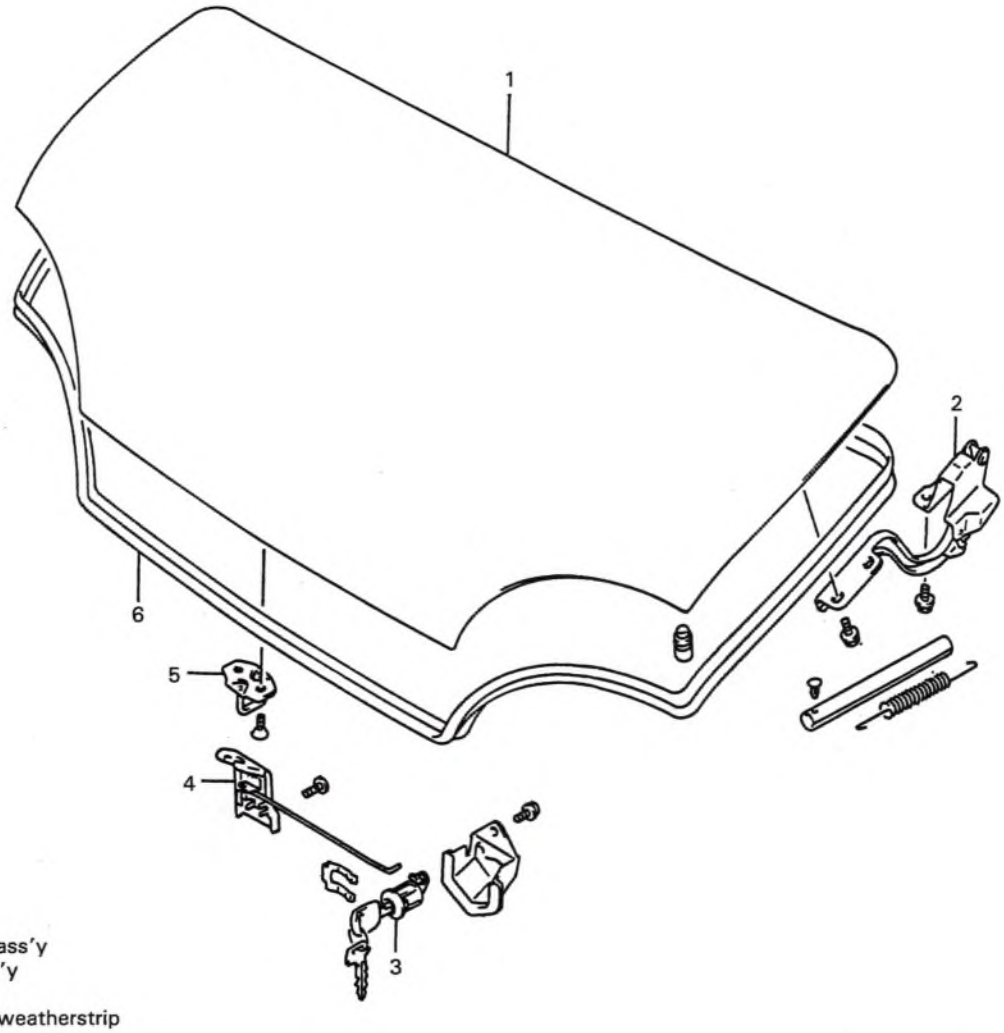
1) Install back window to hinges as shown left.



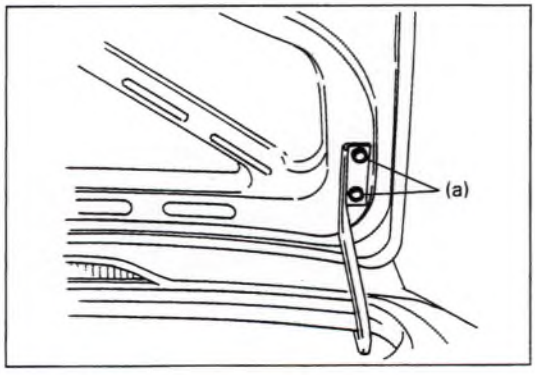
1. Hinge nut
2. Hinge bolt
3. Upper side

2) After turning eccentric nut to such position as indicated in figure at the left, tighten hinge bolt.

TRUNK LID



1. Trunk lid panel
2. Trunk lid hinge
3. Trunk lid cylinder ass'y
4. Trunk lid latch ass'y
5. Trunk lid striker
6. Trunk lid opening weatherstrip

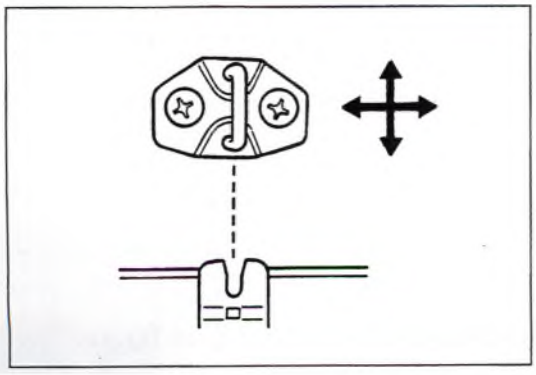


REMOVAL

Remove/Install trunk lid by referring to figure and noting following points.

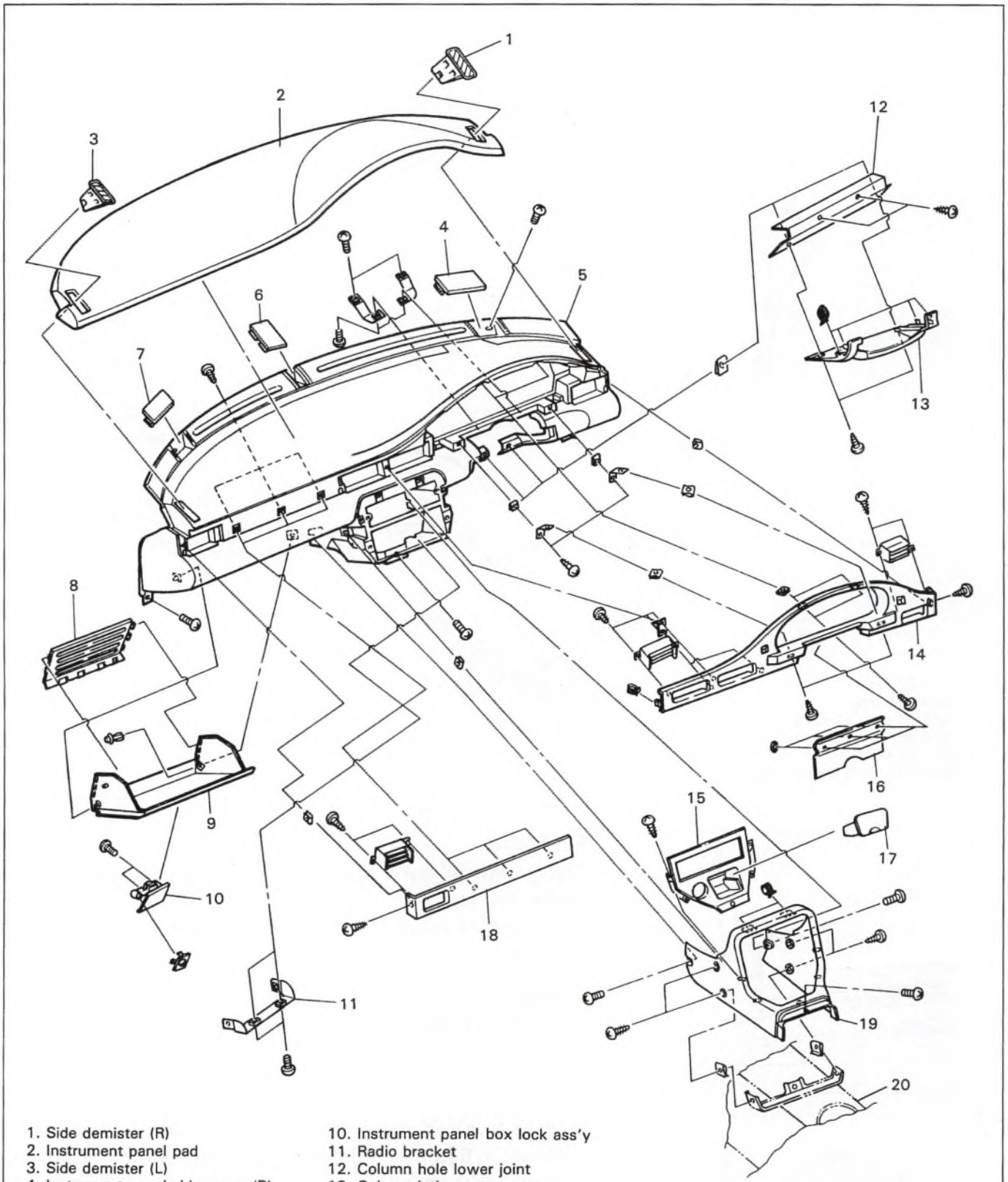
- For installation of trunk lid to hinge, tighten bolts to specified torque.

Tightening Torque
(a): 10—16 N·m (1.0—1.6 kg-m)



- Move trunk lid striker up and down and to both sides as shown in figure so that proper clearance is obtained when trunk lid is closed.

INSTRUMENT PANEL

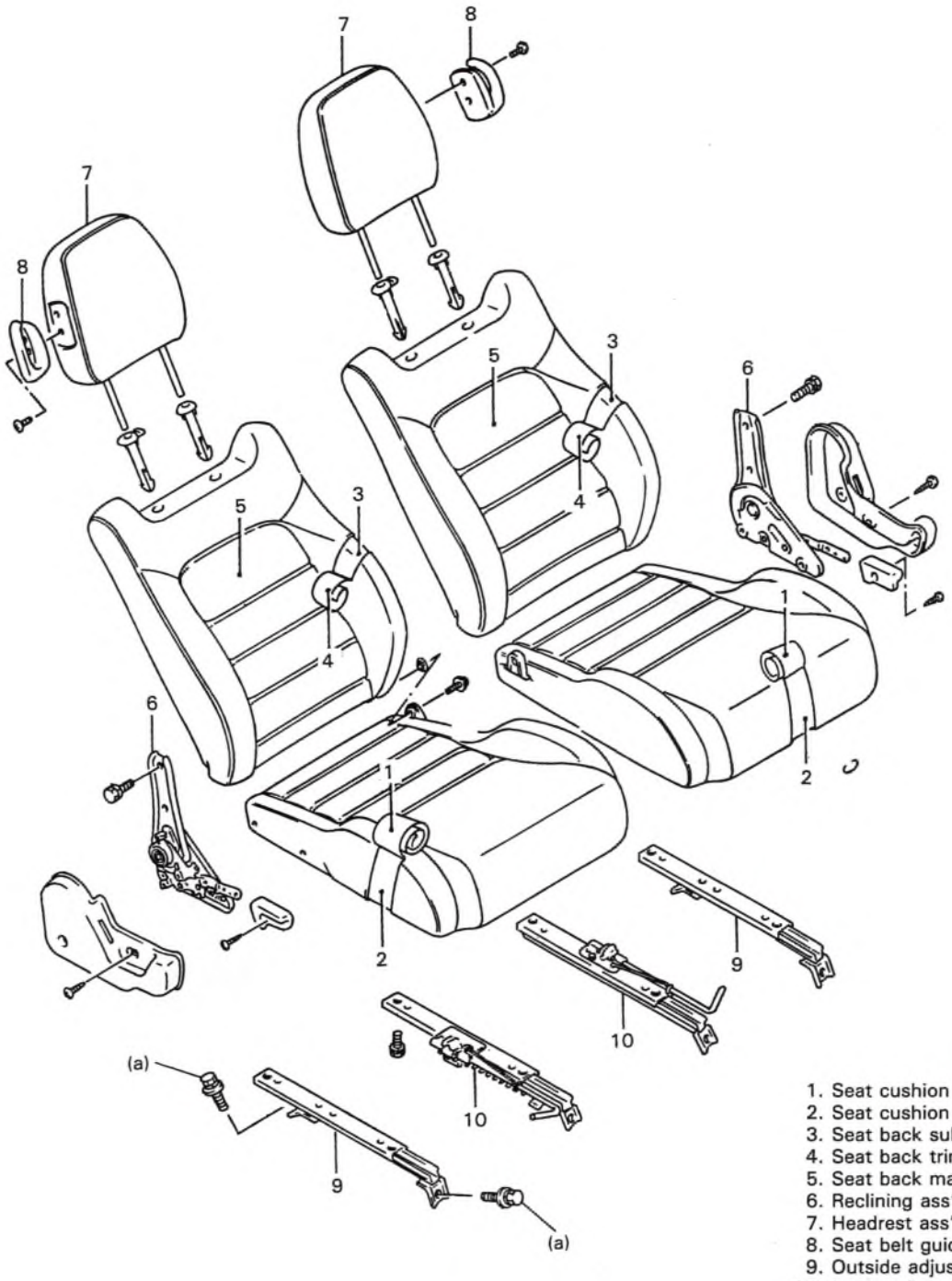


1. Side demister (R)
2. Instrument panel pad
3. Side demister (L)
4. Instrument panel side cover (R)
5. Instrument main panel
6. Instrument panel center cover
7. Instrument panel side cover (L)
8. Instrument panel box panel
9. Instrument panel box
10. Instrument panel box lock ass'y
11. Radio bracket
12. Column hole lower joint
13. Column hole cover
14. Meter cluster hood
15. Center garnish panel
16. Steering column hole flap
17. Ashtray
18. Instrument panel garnish (L)
19. Instrument panel center garnish
20. Main lower center tunnel

REMOVAL AND INSTALLATION

Remove/Install instrument panel by referring to figure.

FRONT SEAT



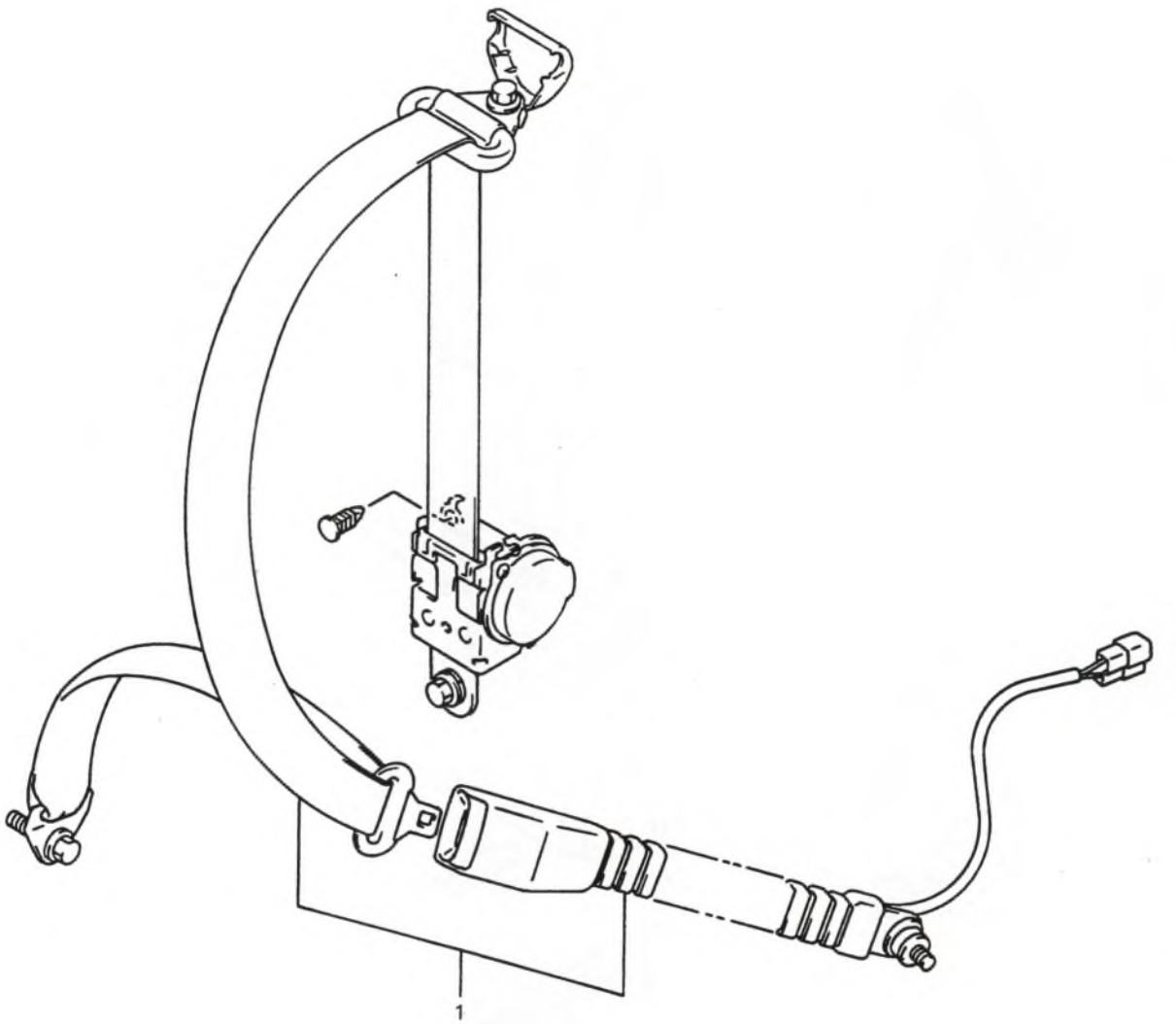
REMOVAL AND INSTALLATION

1) Remove seat rail attaching bolts and remove seat assembly with seat rail.
2) If found faulty, repair or replace seat.
3) Install in reverse order of removal procedure, and tighten seat rail attaching bolts to specified torque.

Tightening Torque

(a): 18—28 N·m (1.8—2.8 kg-m)

SEAT BELT



1. Seat belt assembly

REMOVAL AND INSTALLATION

Remove and install seat belt ass'y referring to above figure and noting following point.

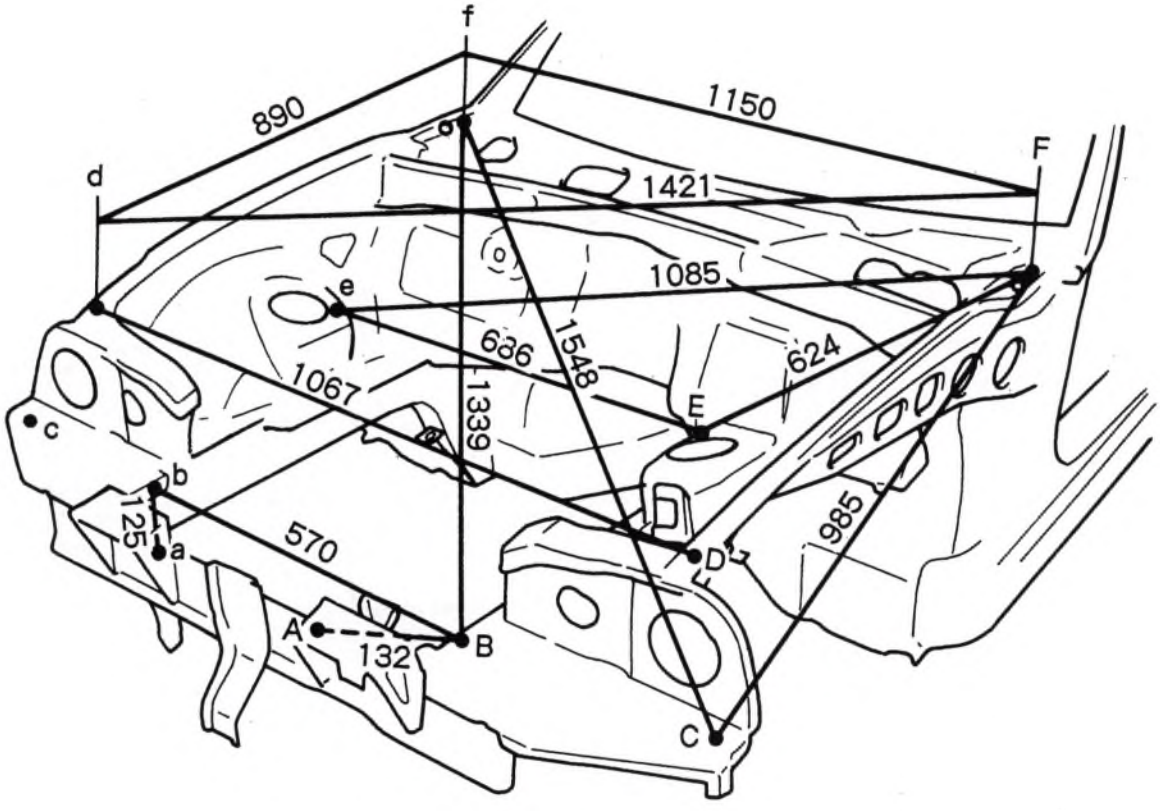
Tighten seal belt attaching bolts to specified torque.

Tightening Torque

(a): 40—50 N·m (4.0—5.0 kg-m)

BODY DIMENSIONS

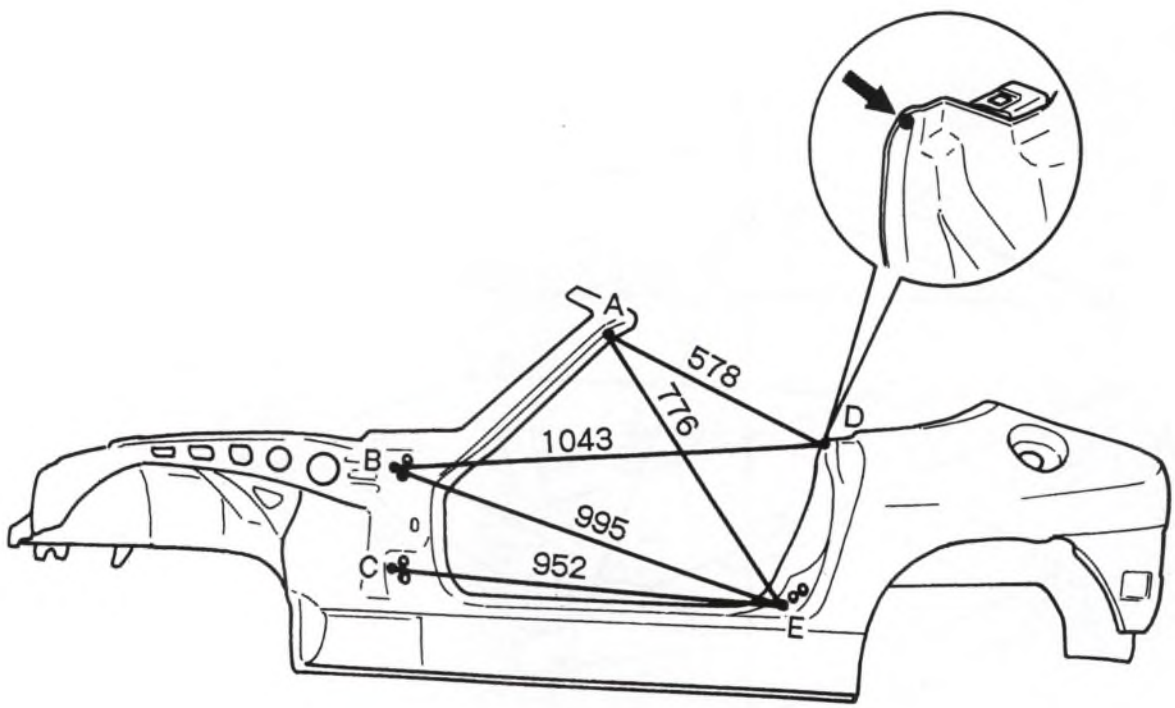
BODY DIMENSIONS



Aa : Intercooler mounting nut hole
Bb : Engine room cover front side mounting hole
Cc : Apron front extension reference hole
Dd : Fender panel mounting nut hole
Ee : Shock absorber mounting hole (rear side) ∅9
Ff : Hood hinge mounting nut hole (rear side)

NOTE:
When only one dimension is given, it is applicable to both right and left.

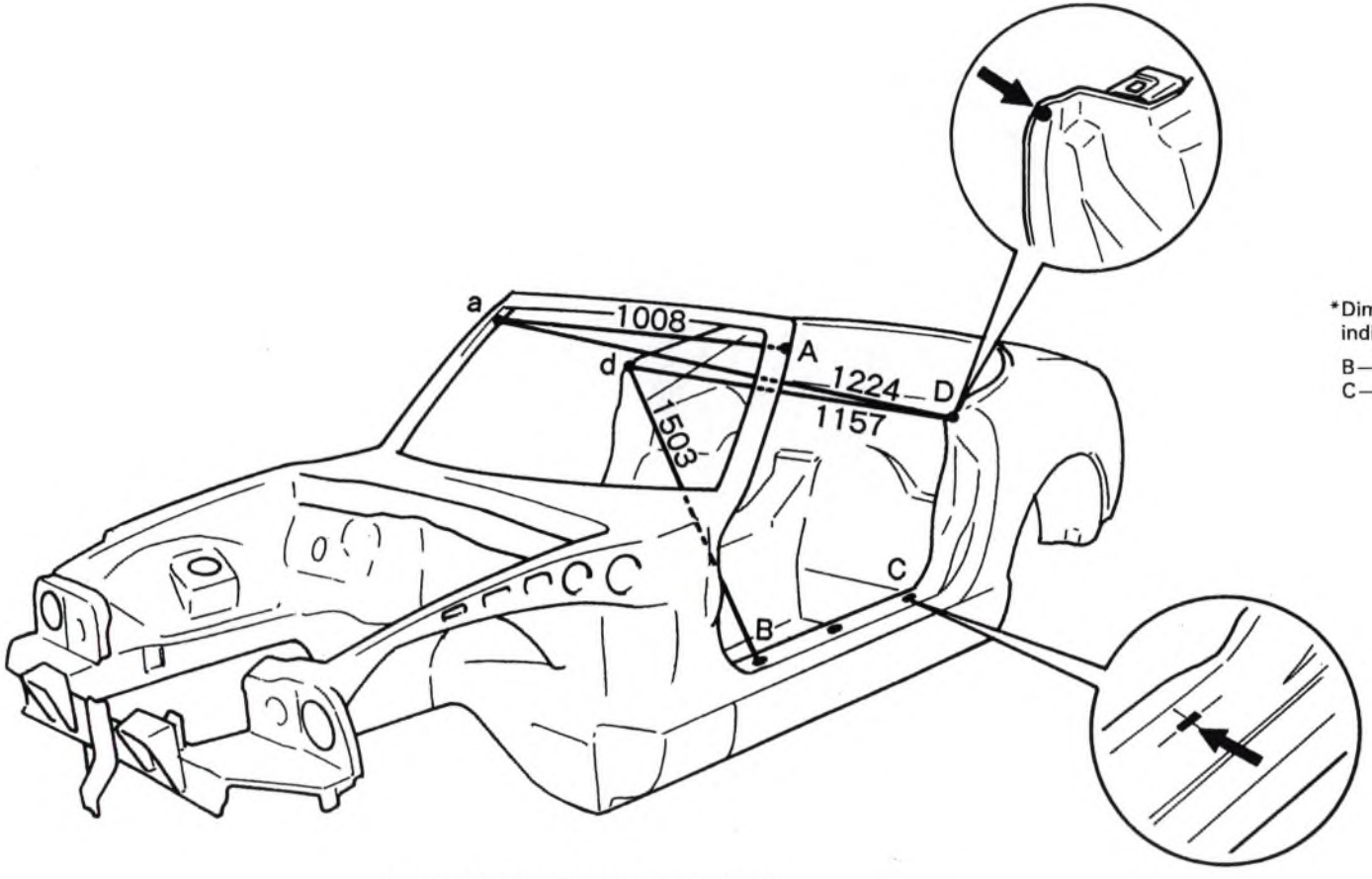
Unit: mm



A : Front outer pillar reference hole ∅7
B : Door hinge mounting nut hole (Front side)
C : Door hinge mounting nut hole (Front side)
D : Quarter outer panel edge section
E : Door cushion mounting hole ∅7

NOTE:
Dimension is applicable to both right and left.

Unit: mm



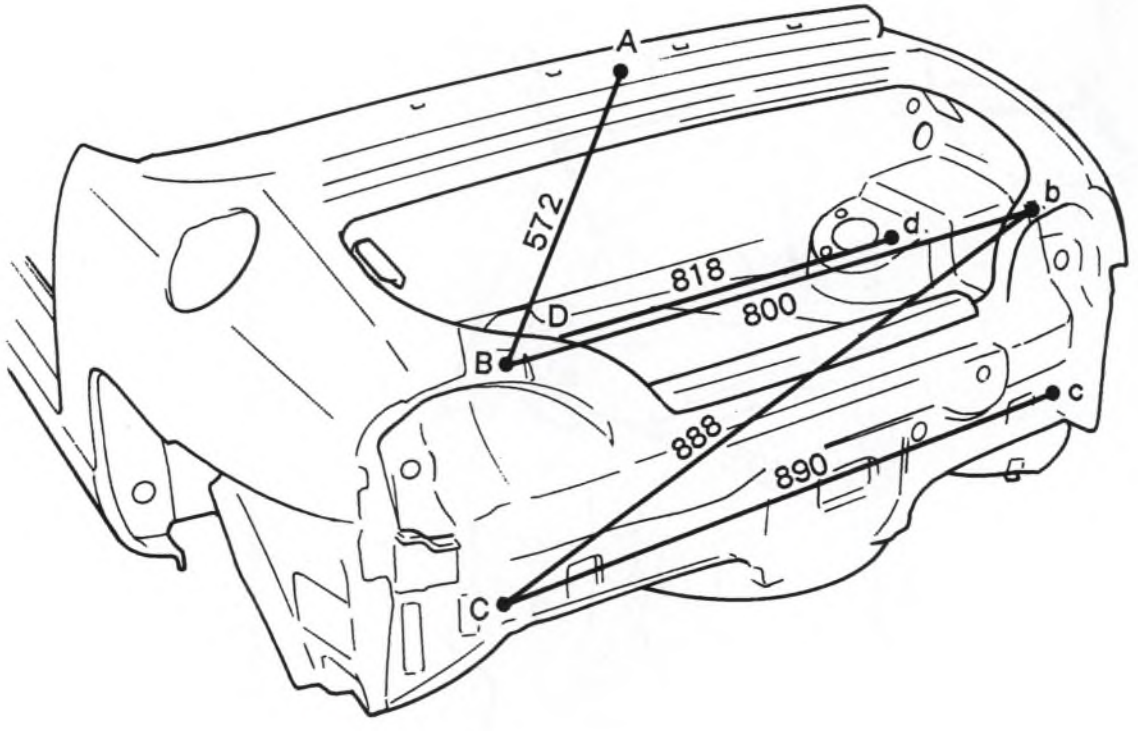
*Dimensions not indicated in figure

B—b: 1241
C—c: 1241

Aa : Front outer pillar reference hole ∅7
Bb : Side sill scuff installation holes 6.5 x 22 (Front side)
Cc : Side sill scuff installation holes 6.5 x 22 (Rear side)
Dd : Edge part of quarter outer panel

Unit: mm

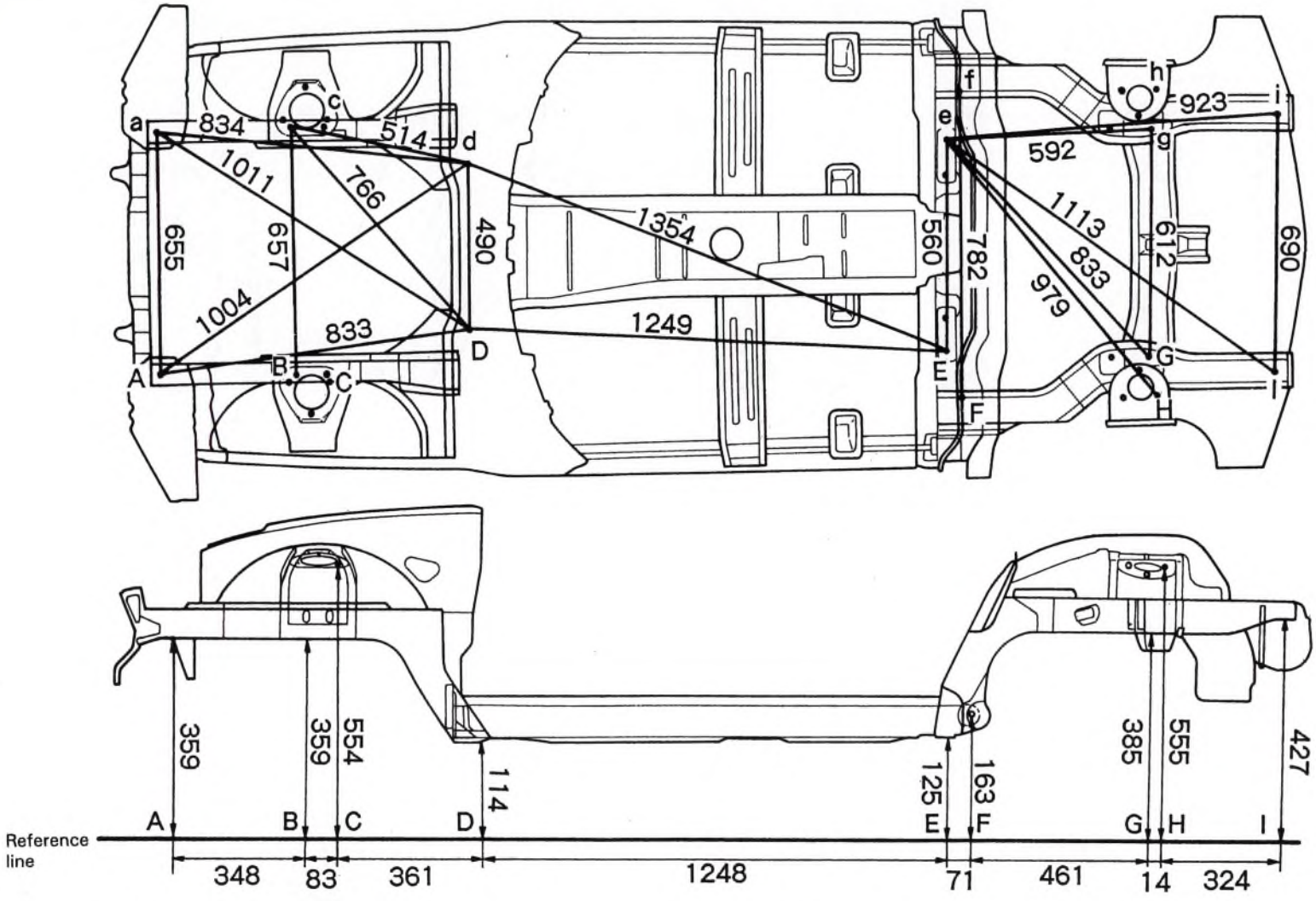
NOTE:
Dimension is applicable to both right and left.



A : Rear window lower panel outer reference hole ∅7
Bb : Rear combination light mounting nut hole
Cc : Rear combination lamp housing reference hole ∅8
Dd : Shock absorber mounting hole (Rear side) ∅10

NOTE:
Dimension is applicable to both right and left.

Unit: mm



Aa : Front under cover mounting nut hole
Bb : Front suspension frame mounting nut hole (Front side)
Cc : Shock absorber mounting hole (Rear side) ∅9
Dd : Front suspension frame mounting nut (Rear side)
Ee : Rear suspension frame mounting nut hole (Outside)

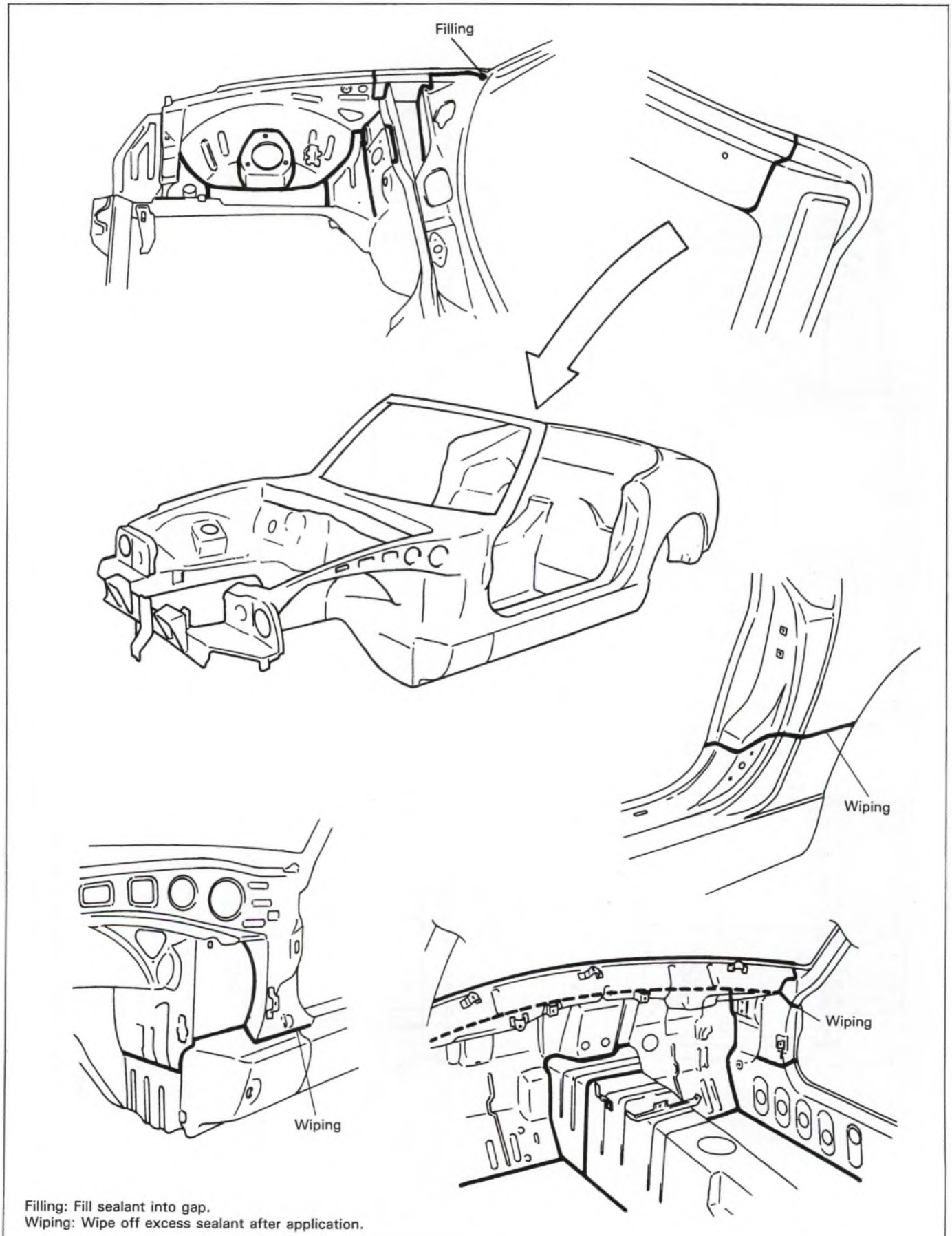
Ff : Rear suspension trailing rod mounting hole ∅12
Gg : Rear suspension frame mounting nut hole (Rear side)
Hh : Shock absorber mounting hole (Rear side) ∅10
Ii : Rear floor side member reference hole ∅20

Unit: mm

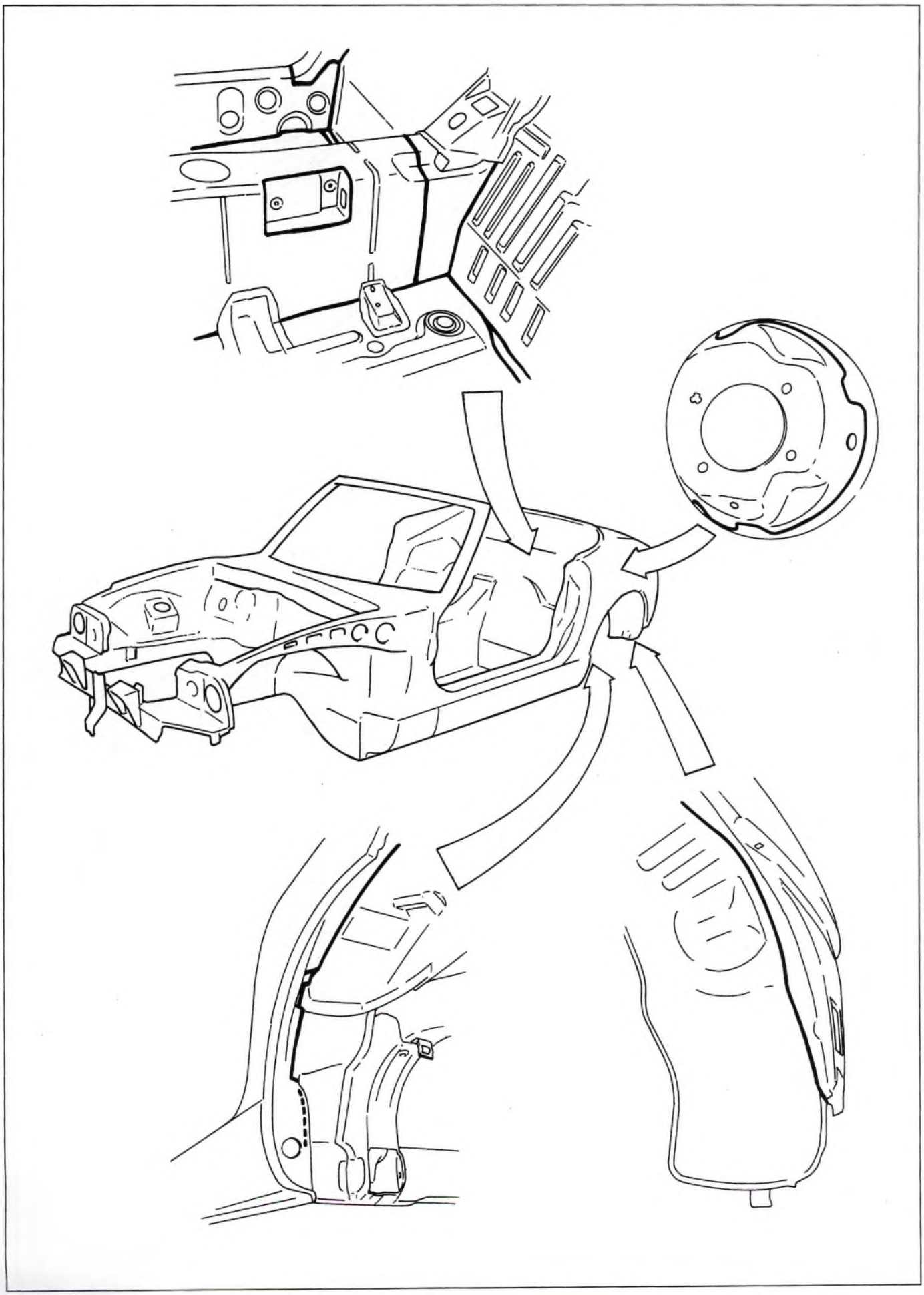
NOTE:
When one dimension is indicated, it is applicable to both right and left.

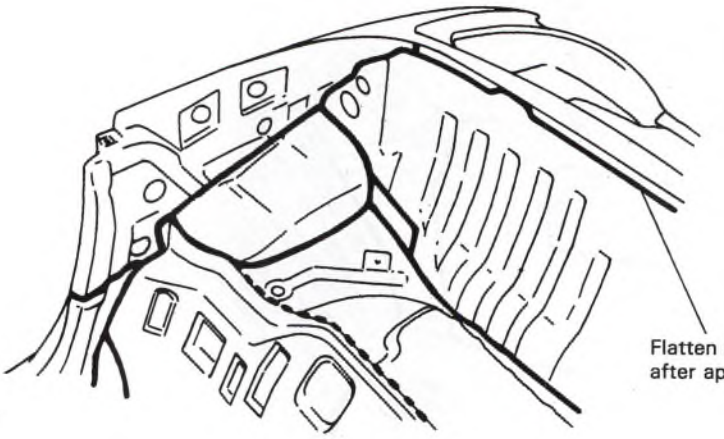
ANTI-CORROSION TREATMENT

SEALANT APPLICATION AREA

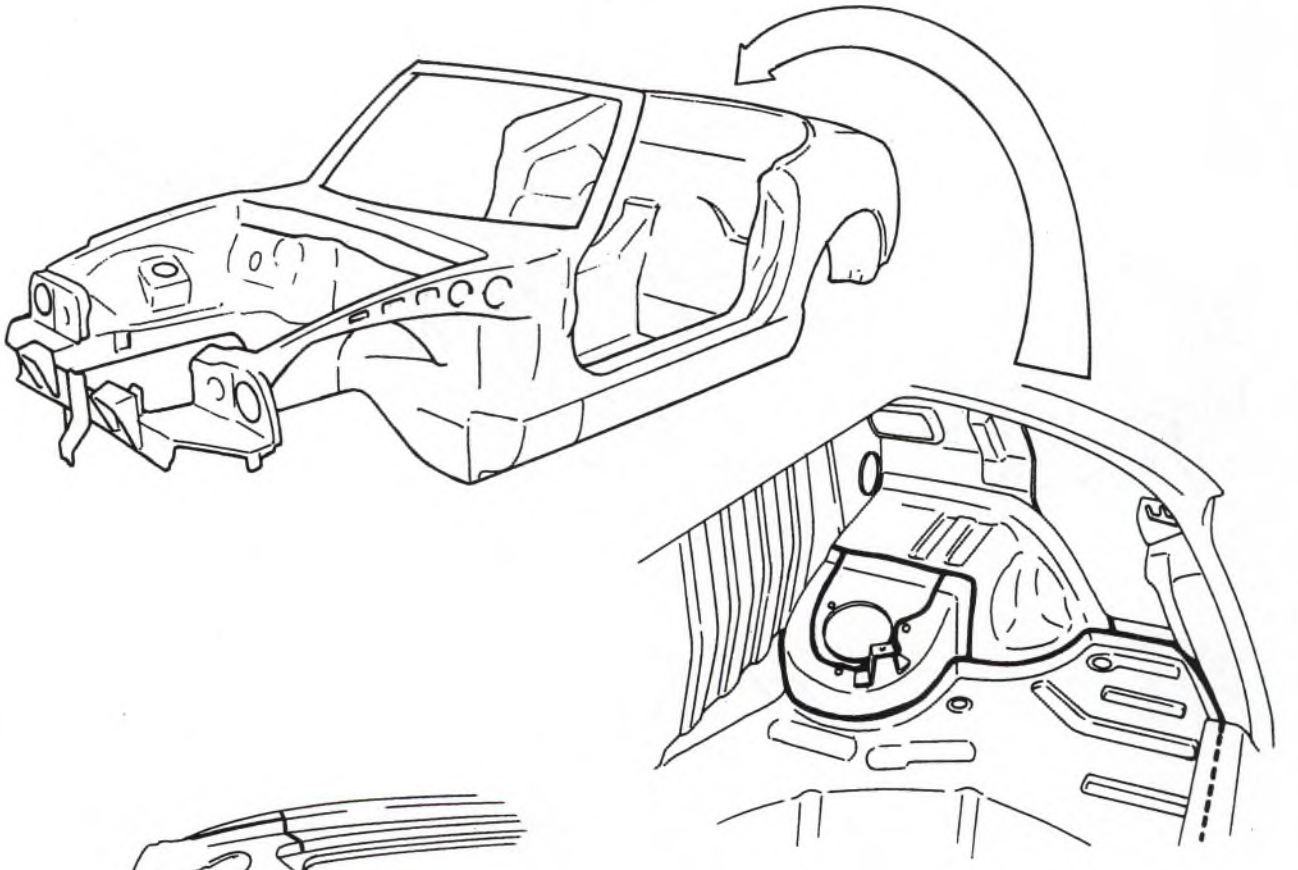


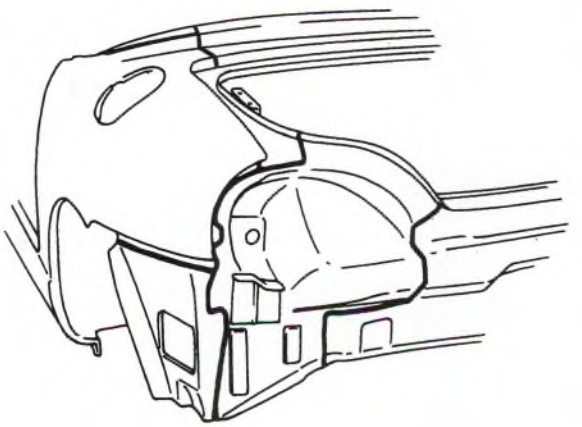
Filling: Fill sealant into gap.
Wiping: Wipe off excess sealant after application.

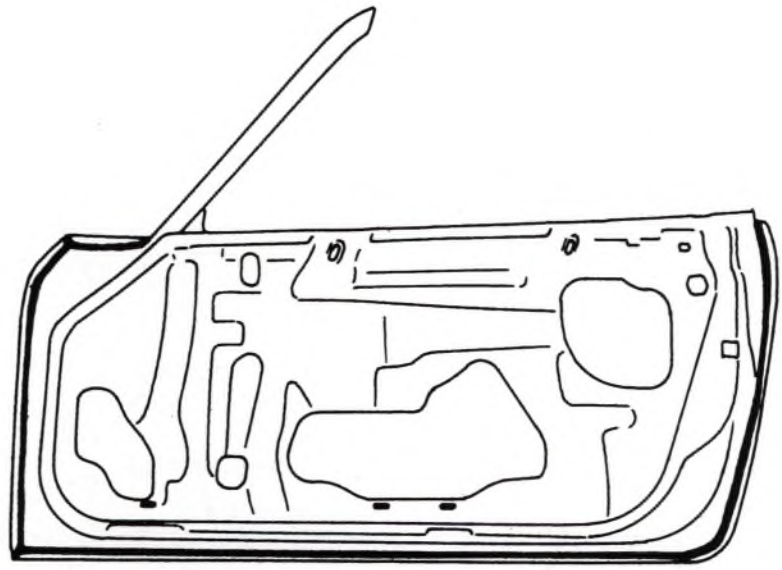


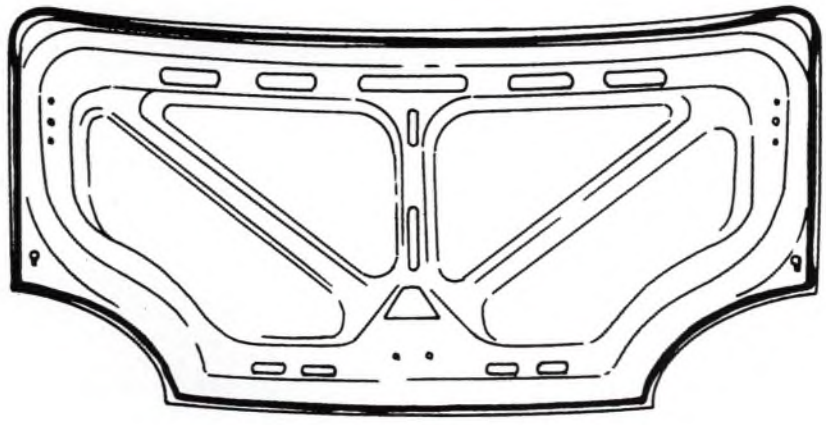


Flatten sealant with brush after application.

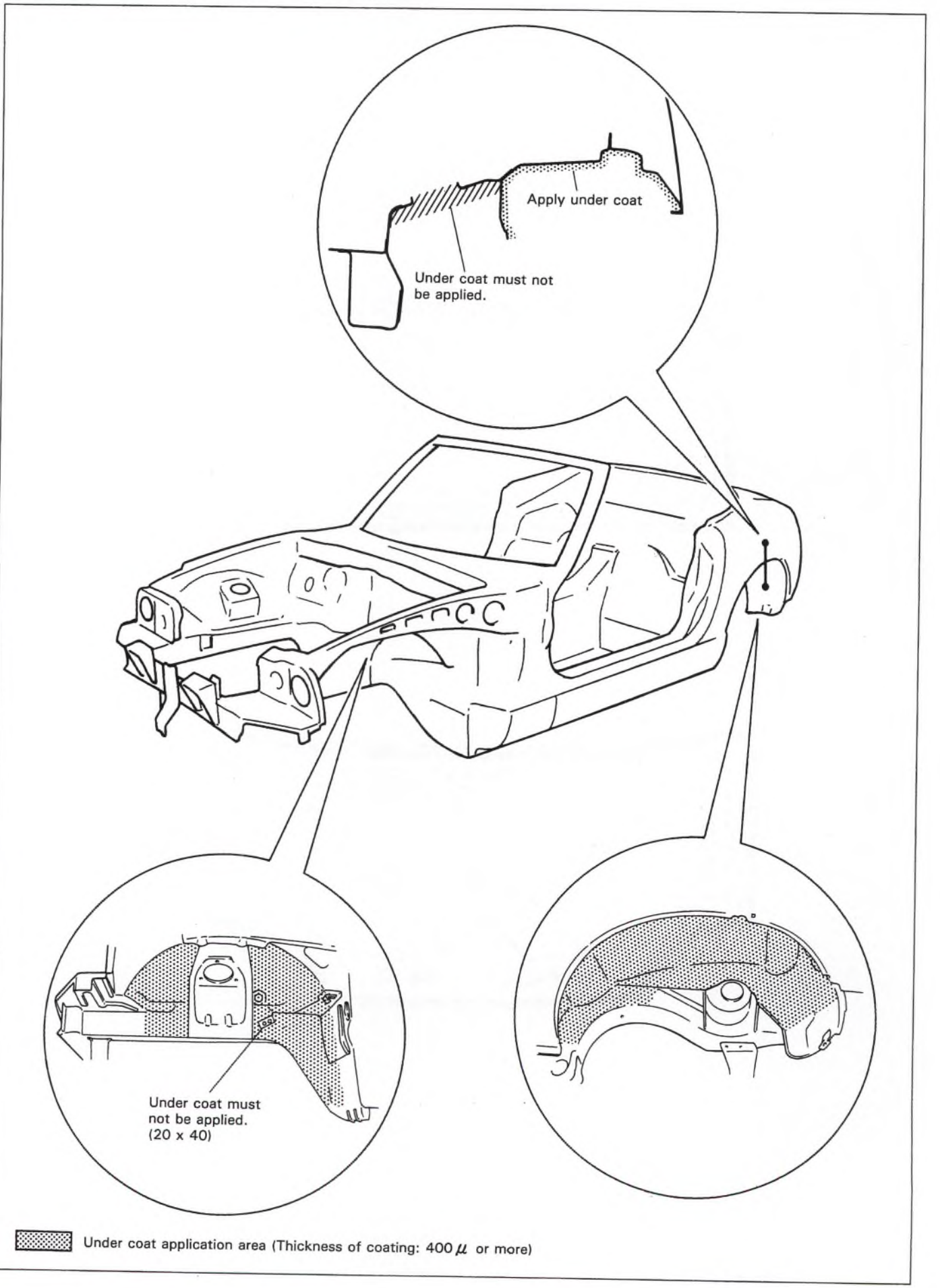




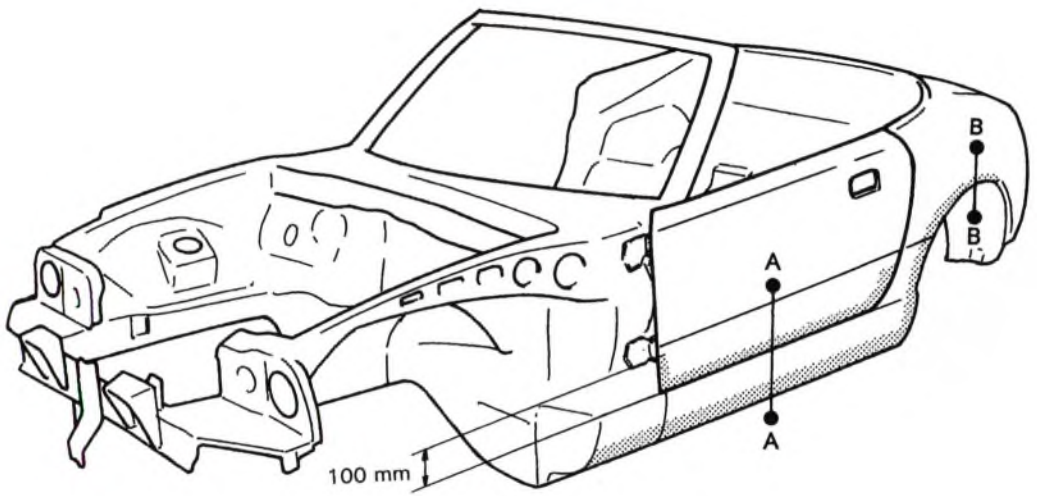


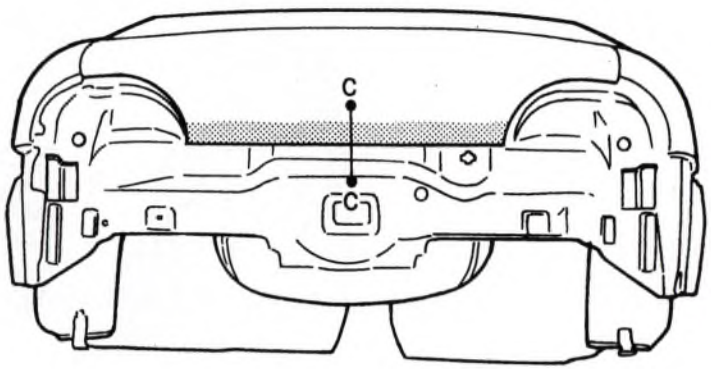


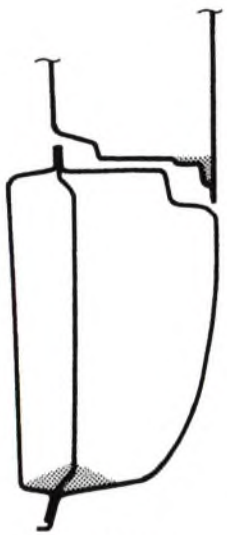
UNDER COAT APPLICATION AREA



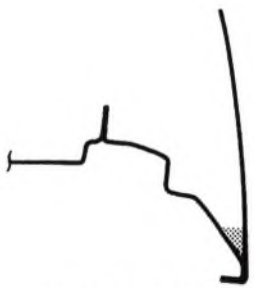
ANTI-CORROSION COMPOUND APPLICATION AREA







SECTION A-A



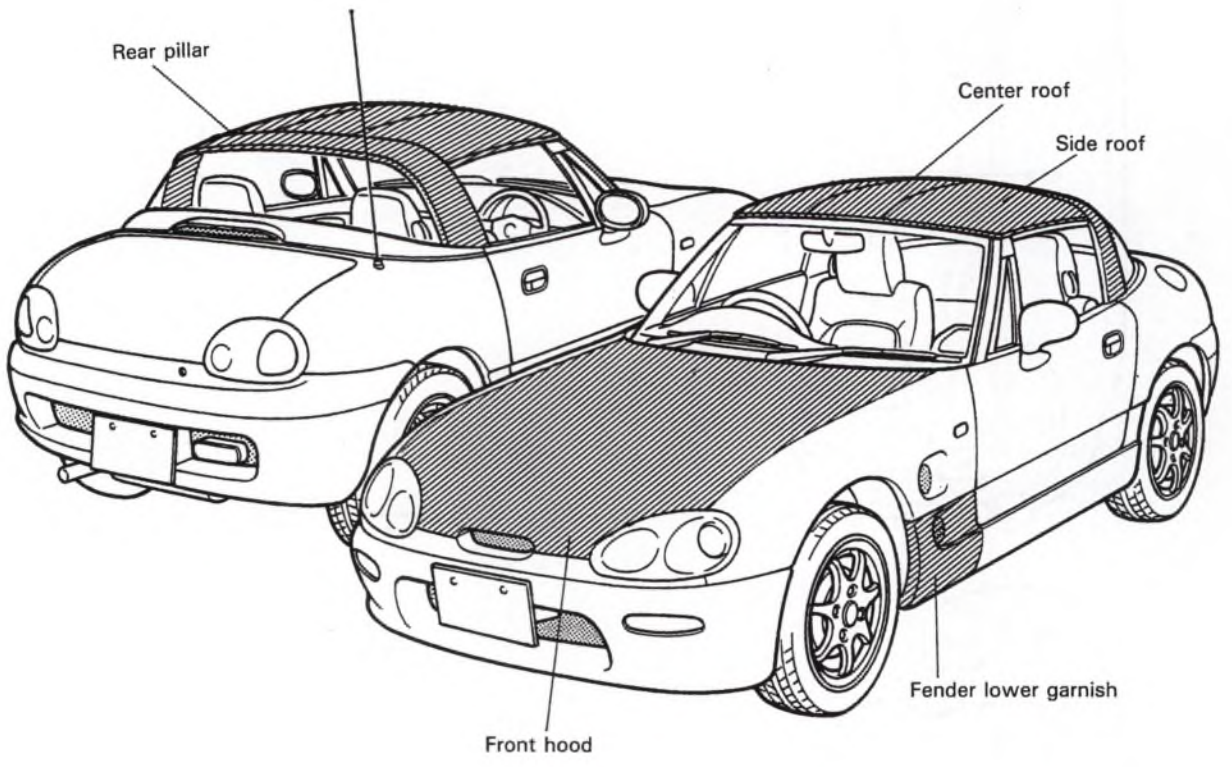
SECTION B-B



SECTION C-C

Anti-corrosion compound application area.

PANELS MADE OF ALUMINUM



SECTION 10

SERVICE DATA

ENGINE

Item				Standard	Service Limit
Compression pressure				12 kg/cm²/250 r/min (rpm)	9.0 kg/cm²/250 r/min (rpm)
	Difference between cylinders			———	1.0 kg/cm²
Cylinder head	Distortion of gasketed surface			———	0.05 mm
	Distortion of manifold seat		Inlet	———	0.1 mm
			Exhaust	———	0.1 mm
	Valve seat	Seating width	Inlet	1.1—1.3 mm	———
			Exhaust	1.1—1.3 mm	———
		Seating angle		45°	———
	Camshaft housing I.D.		①	35.800—35.816 mm	———
			②	36.000—36.016 mm	———
			③	36.200—36.216 mm	———
			④	36.400—36.416 mm	———
			⑤	———	———
Valve, valve spring & cam shaft	Camshaft/Journal clearance			0.040—0.076 mm	0.10 mm
	Cam height (Base circle + lift)		Inlet	30.151 mm	30.050 mm
			Exhaust	30.167 mm	30.060 mm
	Camshaft journal diameter		①	35.740—35.760 mm	———
			②	35.940—35.960 mm	———
			③	36.140—36.160 mm	———
			④	36.340—36.360 mm	———
			⑤	———	———
	Camshaft runout			———	0.10 mm
	Valve stem diameter		Inlet	5.465—5.480 mm	———
			Exhaust	5.440—5.455 mm	———
	Valve guide I.D.		Inlet	5.500—5.512 mm	5.54 mm
			Exhaust		
	Valve guide-to-valve stem clearance		Inlet	0.020—0.047 mm	0.07 mm
			Exhaust	0.045—0.072 mm	0.09 mm
	Contact width of valve and valve seat		Inlet	1.1—1.3 mm	———
			Exhaust		
	Valve spring free length		Inlet	46.9 mm	45.8 mm
			Exhaust		
	Valve spring preload		Inlet	19.8—22.8 kg for fitting length 37.5 mm	18.4 kg for fitting length 37.5 mm
			Exhaust		

Item			Standard	Service Limit
Valve, valve spring & cam shaft	Valve stem end deflection	Inlet	—	0.14 mm
		Exhaust	—	0.18 mm
	Stock allowance of valve stem end face		—	0.5 mm
	Valve head radial runout		—	0.08 mm
	Valve spring squareness		—	2.0 mm
	Valve guide protrusion (In. & Ex.)		17 mm	—
Cylinder	Flatness of gasketed surface		—	0.05 mm
	Wear limit on bore		—	0.07 mm
	Cylinder-to-piston clearance		0.025—0.055 mm	—
Piston	Piston diameter	Standard	64.965—64.985 mm	—
		Oversize 0.25 mm	65.215—65.235 mm	—
		Oversize 0.50 mm	65.465—65.485 mm	—
	Piston pin outside diameter		17.995—18.000 mm	—
	Piston pin I.D.		18.006—18.014 mm	—
	Piston pin clearance		0.006—0.019 mm	—
Piston ring	Ring clearance in groove	Top ring	0.03—0.07 mm	0.12 mm
		2nd ring	0.02—0.06 mm	0.10 mm
	Piston ring end gap	Top ring	0.12—0.27 mm	0.7 mm
		2nd ring	0.12—0.27 mm	
		Oil ring	0.20—0.70 mm	1.8 mm
Connecting rod	Connecting rod alignment	Bow	—	0.05 mm
		Twist	—	0.10 mm
	Connecting rod big end bore		0.020—0.064 mm	—
	Connecting rod big end clearance		0.1—0.2 mm	0.35 mm
Crankshaft	Crankshaft runout		—	0.03 mm
	Out-of-round and taper of journals		—	0.02 mm
	Crankshaft journal diameter		43.982—44.000 mm	—
	Crankshaft pin diameter		37.982—38.000 mm	—
	Crankshaft main bearing clearance		0.020—0.064 mm	—
	Crankshaft thrust play		0.11—0.31 mm	0.35 mm

FUEL

Item	Standard	Service Limit
Engine idle speed	950±50 r/min	—
IAC duty at specified idle speed	35±5% (On duty)	—
A/F duty at specified idle speed	60±5% (On duty)	—
Fuel pressure	2.2±0.2 kg/cm²	—

CLUTCH, TRANSMISSION & DIFFERENTIAL

Item			Standard	Service Limit
Clutch	Clutch pedal	Free travel	20—30 mm	———
	Facing wear (Rivet head depth)		1.3 mm	0.1 mm
Transmission	Transmission oil		API GL-4 SAE 75W-90	———
	Transmission oil capacity		1.06 ℓ	———
	Clearance between gears and rings		1.0 mm	0.5 mm
	Key slot width synchronizer ring		9.6 mm	10.0 mm
	Sleeve-to-shift fork clearance		0.2—0.6 mm	1.0 mm
	Thickness of shift fork claw		5.6—5.8 mm	5.1 mm
Differential	Differential oil		Hypoid gear oil API GL-5 SAE 80W-90	———
	Differential oil capacity		0.8 ℓ	———
	Drive bevel gear back lash		0.1—0.2 mm	———
	Drive bevel pinion bearing preload		5—13 kg-cm	———
Propeller shaft runout			———	1.0 mm

COOLING SYSTEM

Item		Standard	Service Limit
Cooling system	Engine coolant capacity	4.0 ℓ	———
	Temperature at fan thermo switch "ON"	93±5°	———
	Radiator cap holding pressure	0.75—1.05 kg/cm²	———
	Thermostat start-to-open temperature	82°C	———
	Thermostat full-open temperature	95°C	———

ELECTRICAL

Item			Standard	Service Limit
Ignition system	Ignition order		1—3—2	———
	Distributor air gap		0.2—0.4 mm	———
	Ignition timing (BTDC)		5±1° at 950 r/min (Initial ignition timing)	———
	High tension cord resistance		10—22 kΩ/m	———
	Ignition coil; Primary coil resistance (Cold)		1.35—1.65 ohms	———
	Ignition coil; Secondary coil resistance (Cold)		23.4—28.6 kiloohms	———
	Spark plug	NGK	DCP7EVX	———
		NIPPONDENSO	XU22EPR-ZU	———
	Spark plug gap		0.8—0.9 mm	———

Item			Standard	Service Limit
Starter motor	Voltage		12 volts	———
	Output		0.8 kW	———
	Rating		30 seconds	———
	Brush length		17 mm	11.5 mm
	Commutator diameter		28 mm	27 mm
	Mica depth		0.5—0.8 mm	0.2 mm
	Commutator out of round		0.05 mm or less	0.4 mm
Charging system	Nominal operation voltage		12 volts	———
	Maximum alternator output		50A	———
	Generator drive belt tension	When reusing belt	7—11 mm	———
		When using new belt	7—9 mm	———
A/C system	A/C compressor drive belt tension		5—10 mm	———
	Specified idle speed with A/C ON		1050±50 r/min	———
	IAC duty at specified idle speed with A/C ON		35±5%	———

STEERING WHEEL & SUSPENSION

Item			Standard	Service Limit
Front wheel alignment	Toe-in		−1~1 mm	———
	Camber		0°00′±1°	———
	Caster		4°30′±2°	———
	Steering angle	Inside	35°	———
		Outside	32°	———
	Side slip		1 (out)—2 (in) mm/m	———
Steering wheel play			0—30 mm	———
Rotation torque of rack pinion			8—13 kg/cm	———
Rear wheel alignment	Toe-in		0—4 mm	———
	Camber		−1°00′	———
	Caster		1 (out)—2 (in) mm/m	———

BRAKE

Item			Standard	Service Limit
Brake pedal	Brake pedal play		1—8 mm	———
	Clearance between brake pedal and dash panel		100 mm or more	———
Front brake	Front disc pad thickness		15.0 mm	8 mm
	Front brake disc	Deflection	———	0.1 mm
		Thickness	17.0 mm	15.0 mm
Rear brake	Rear disc pad thickness		12.5 mm	6.5 mm
	Rear brake disc	Deflection	———	0.1 mm
		Thickness	10.0 mm	8.0 mm
Parking brake stroke (When lever pulled up at 20 kg)			3—8 notches	———

Prepared by

SUZUKI MOTOR CORPORATION

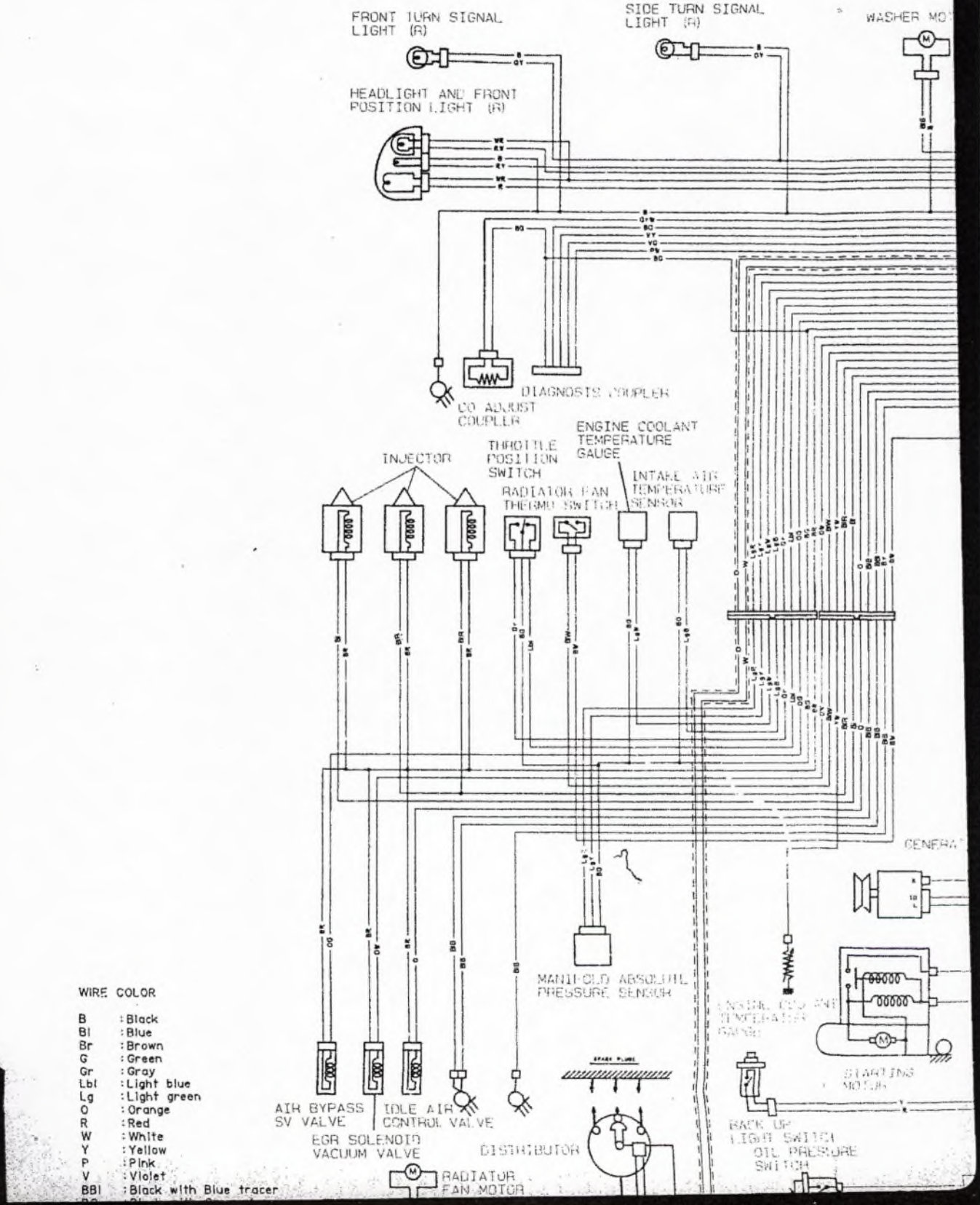
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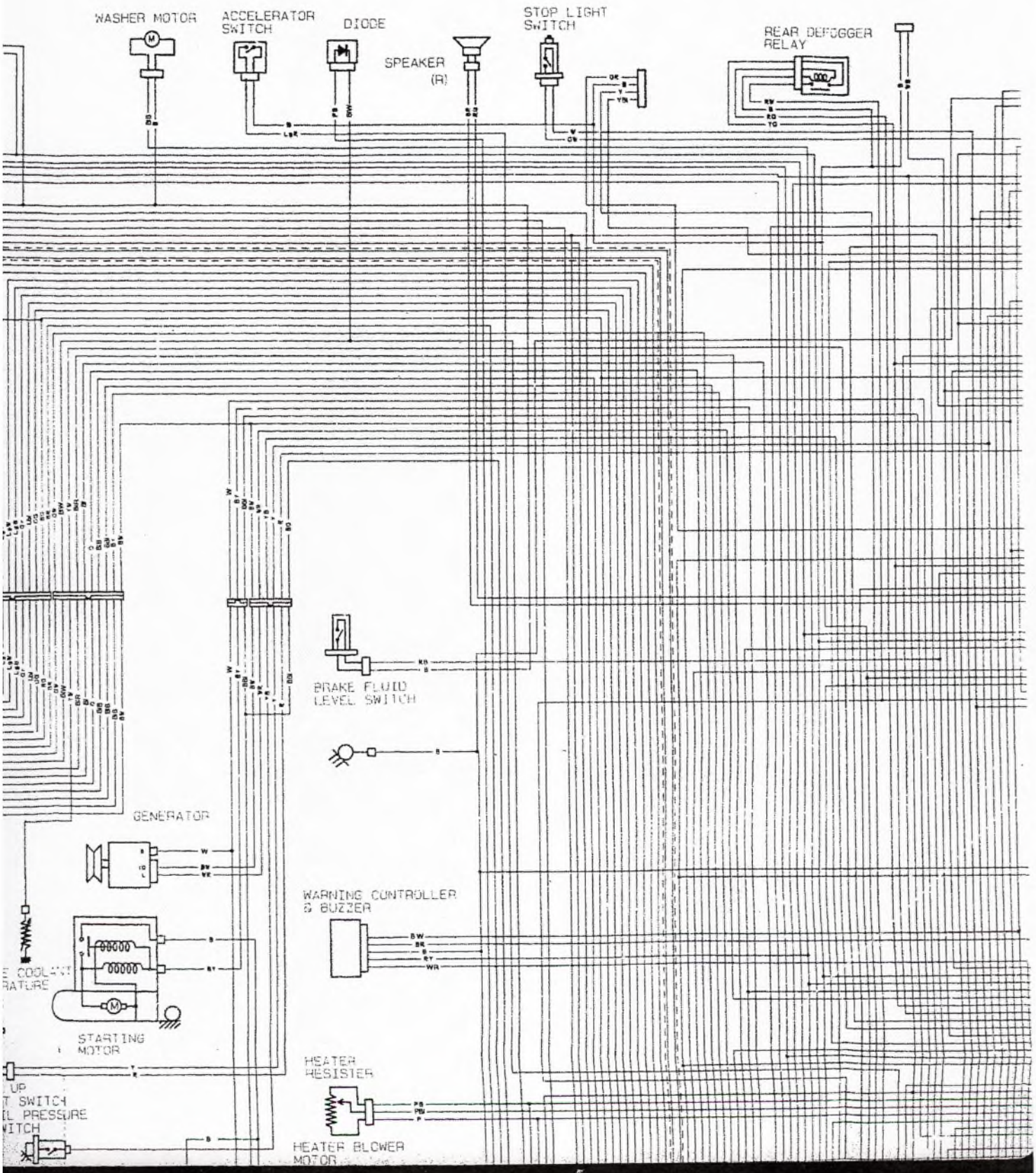
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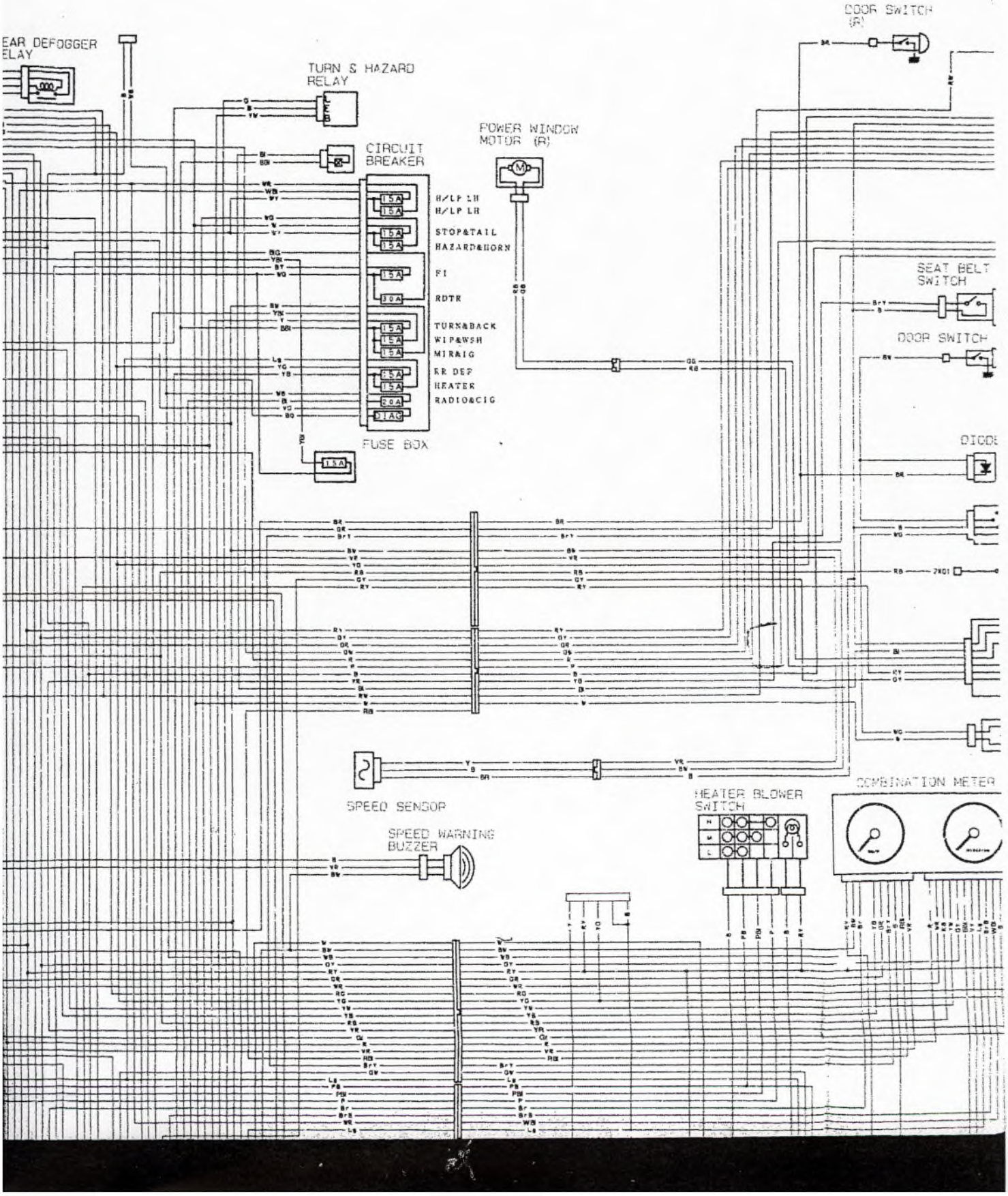
SX306 WIRING DIAGRAM

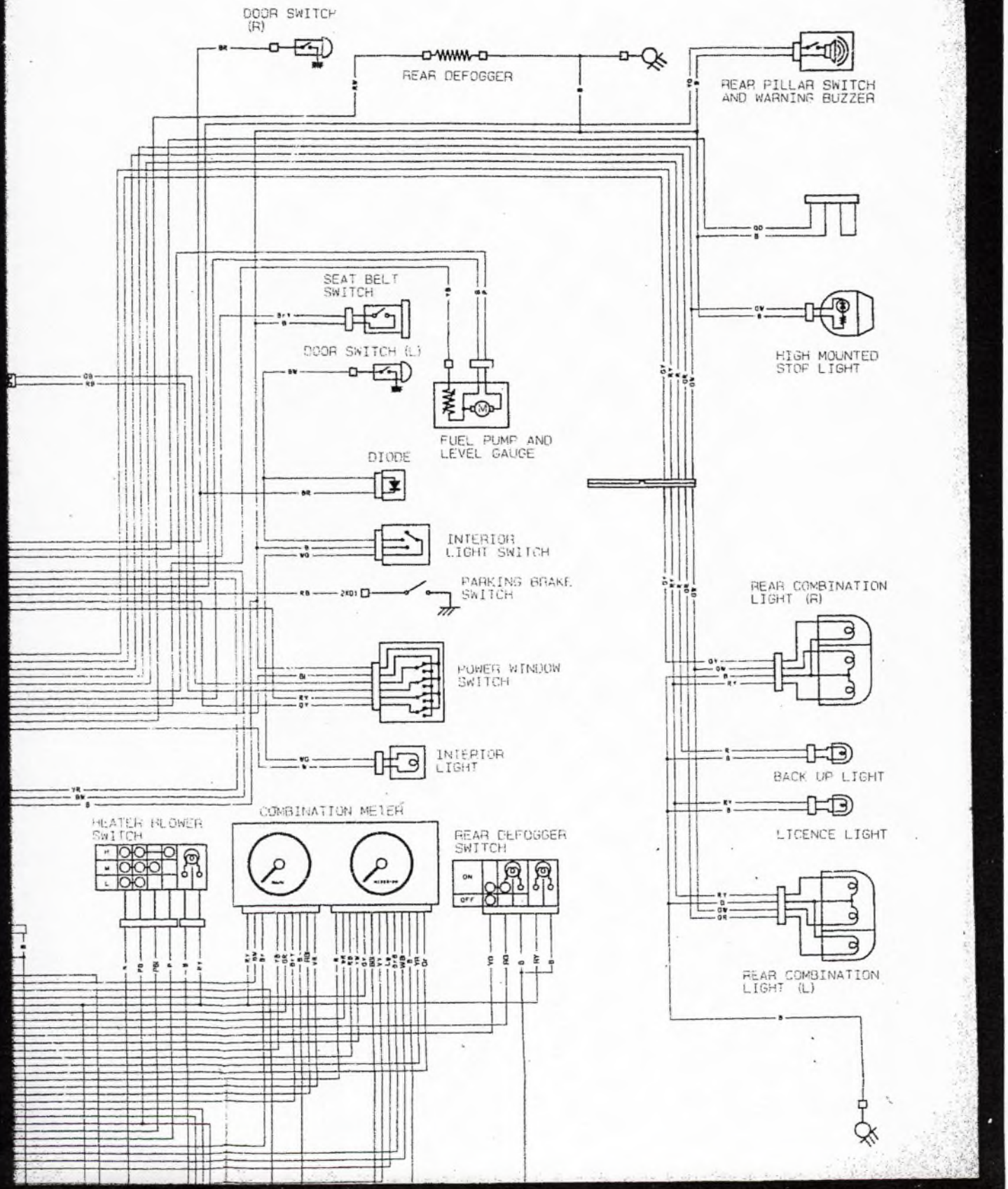


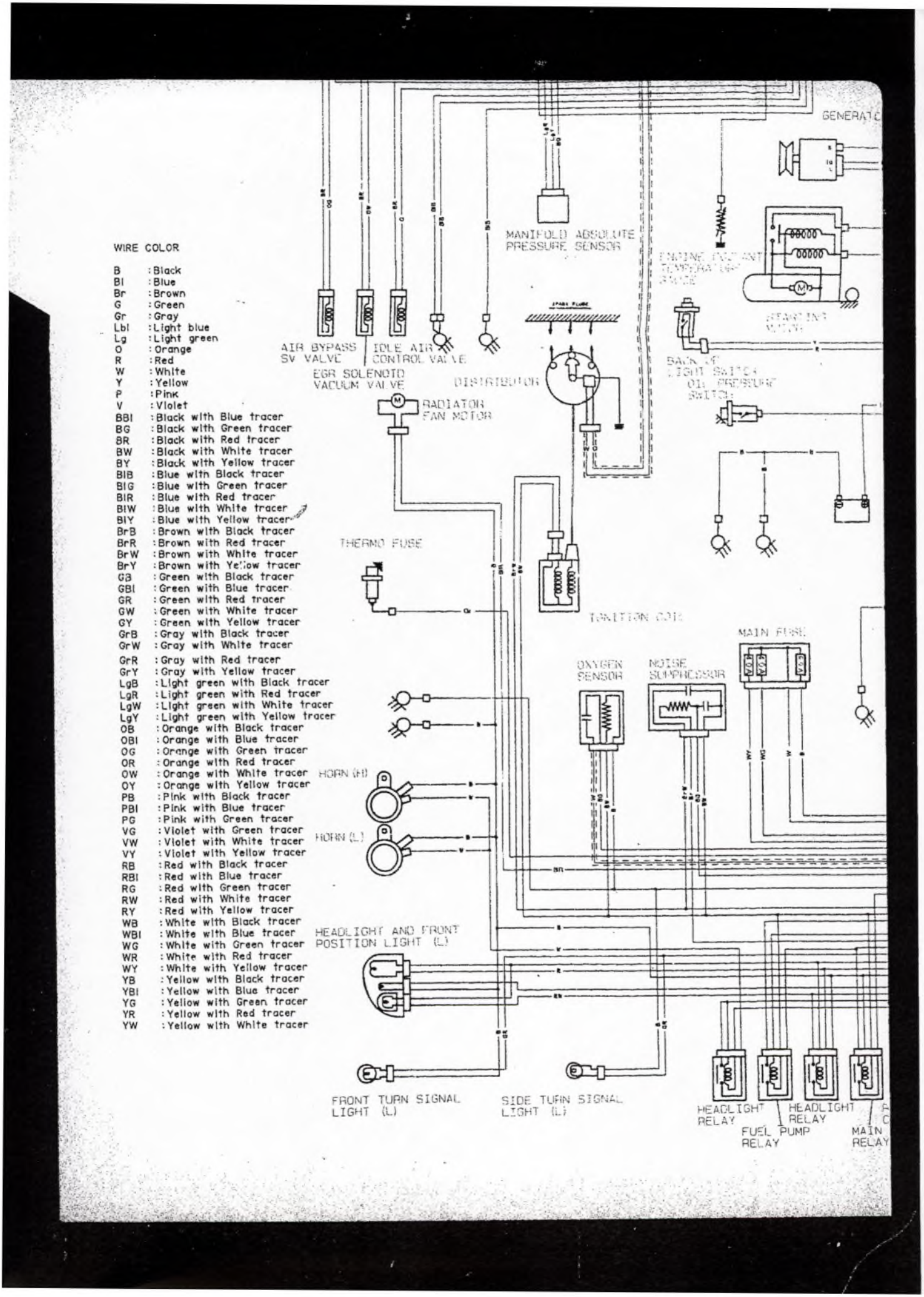
WIRE COLOR

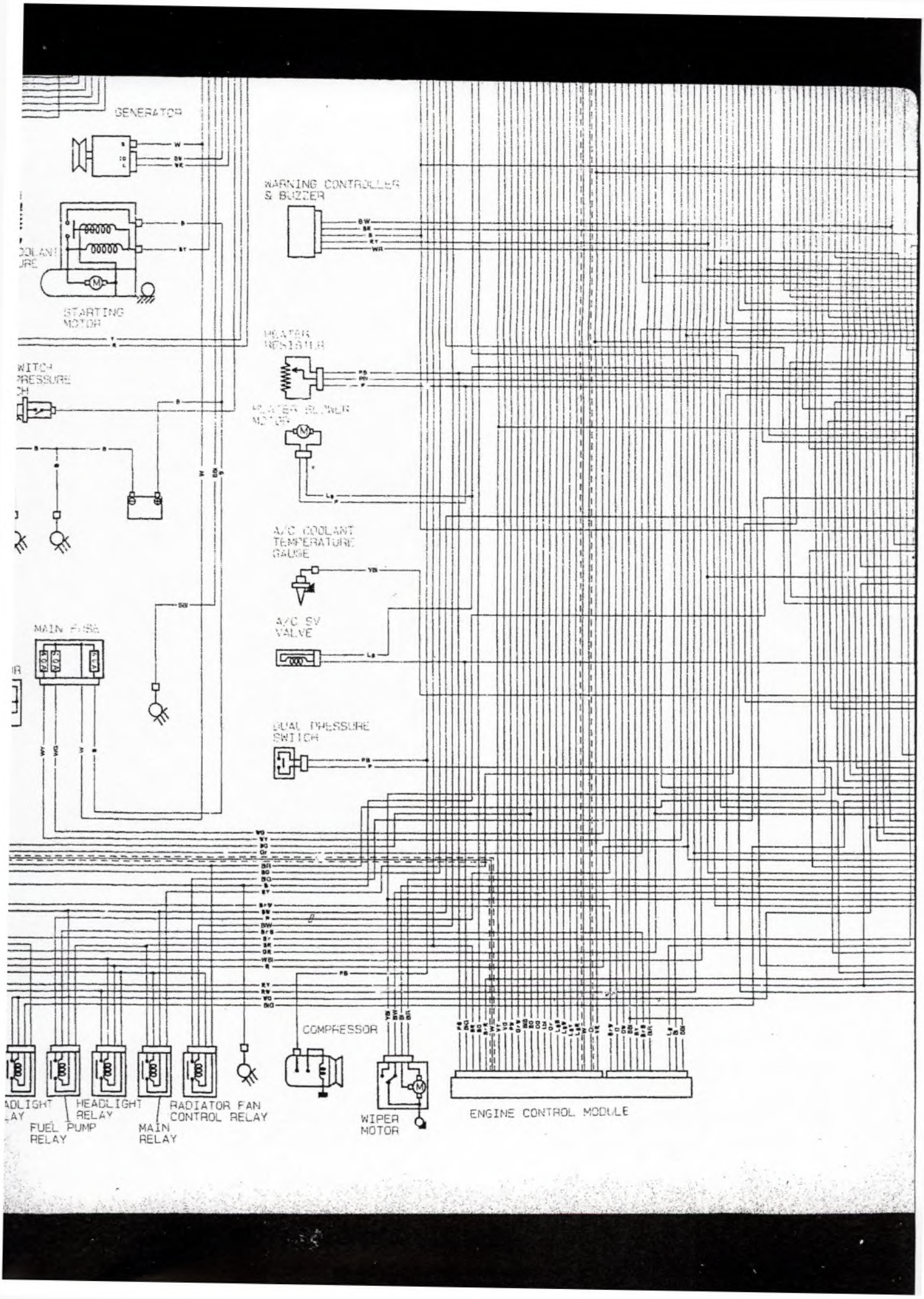
B	:Black
Bl	:Blue
Br	:Brown
G	:Green
Gr	:Gray
Lbl	:Light blue
Lg	:Light green
O	:Orange
R	:Red
W	:White
Y	:Yellow
P	:Pink
V	:Violet
BBl	:Black with Blue tracer

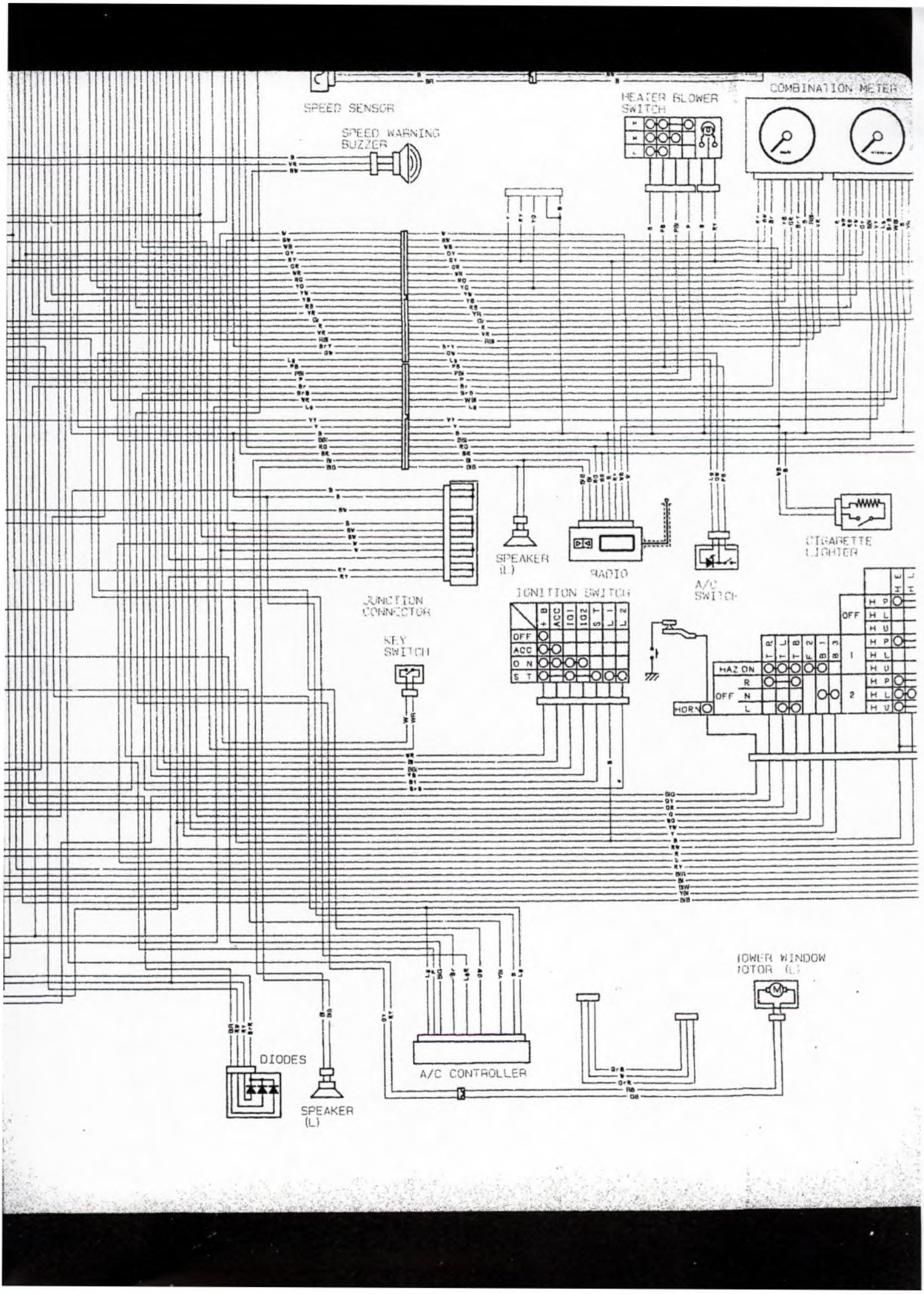

WASHER MOTOR
ACCELERATOR SWITCH
DIODE
SPEAKER (R)
STOP LIGHT SWITCH
REAR DEFOGGER RELAY
BRAKE FLUID LEVEL SWITCH
GENERATOR
WARNING CONTROLLER & BUZZER
STARTING MOTOR
HEATER RESISTER
HEATER BLOWER MOTOR

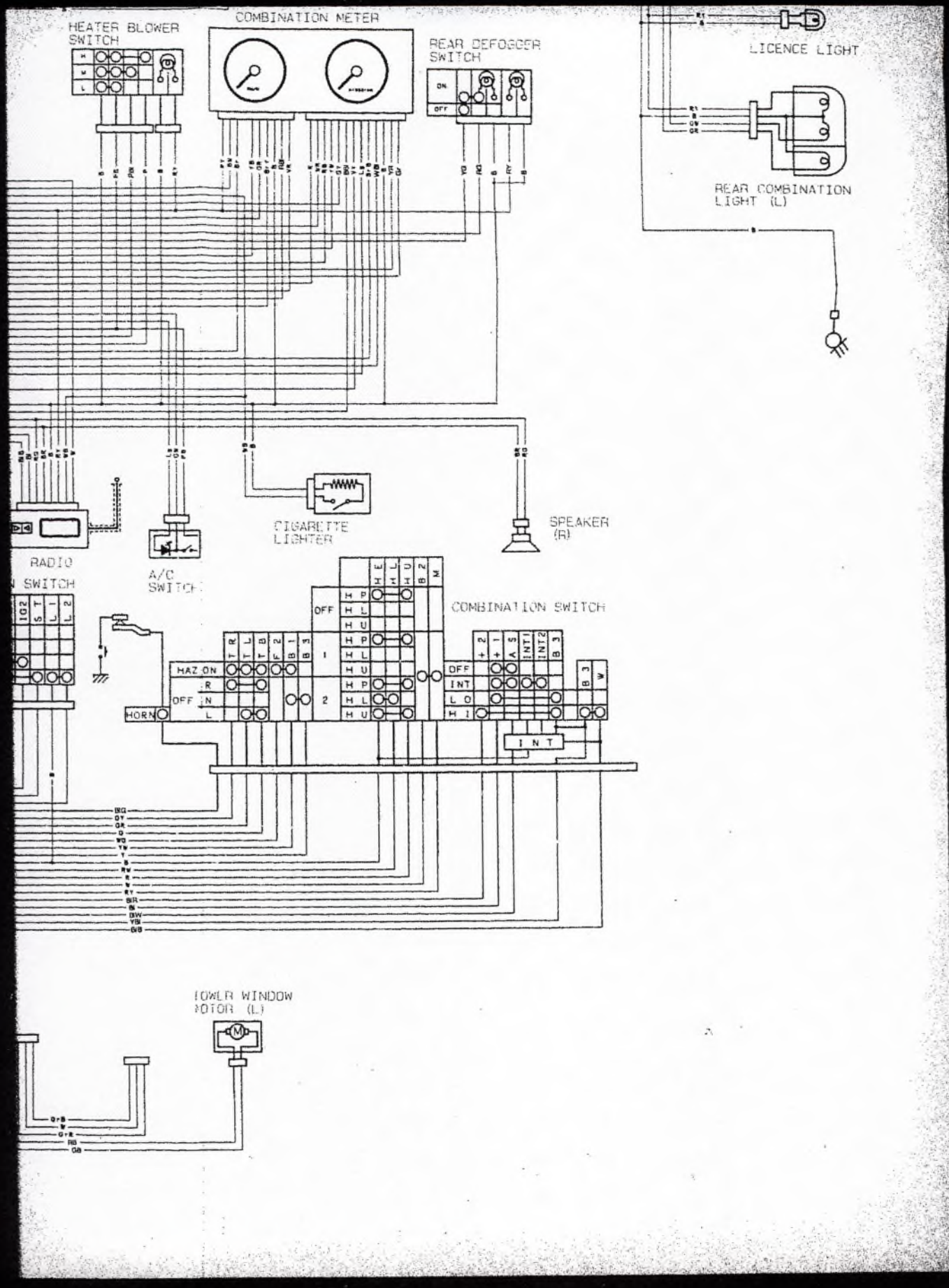

EAR DEFOGGER
ELAY
TURN & HAZARD
RELAY
CIRCUIT
BREAKER
POWER WINDOW
MOTOR (R)
DOOR SWITCH
(R)
SEAT BELT
SWITCH
DOOR SWITCH
DIODE
H/LP LH
H/LP LH
STOP&TAIL
HAZARD&HORN
FI
RDTR
TURN&BACK
WIP&WSH
MIR&IG
RR DEF
HEATER
RADIO&CIG
FUSE BOX
SPEED SENSOR
SPEED WARNING
BUZZER
HEATER BLOWER
SWITCH
COMBINATION METER


DOOR SWITCH (R)
REAR DEFOGGER
REAR PILLAR SWITCH AND WARNING BUZZER
SEAT BELT SWITCH
DOOR SWITCH (L)
HIGH MOUNTED STOP LIGHT
FUEL PUMP AND LEVEL GAUGE
DIODE
INTERIOR LIGHT SWITCH
PARKING BRAKE SWITCH
REAR COMBINATION LIGHT (R)
POWER WINDOW SWITCH
INTERIOR LIGHT
BACK UP LIGHT
COMBINATION METER
HEATER BLOWER SWITCH
REAR DEFOGGER SWITCH
LICENCE LIGHT
REAR COMBINATION LIGHT (L)


WIRE COLOR
B :Black
Bl :Blue
Br :Brown
G :Green
Gr :Gray
Lbl :Light blue
Lg :Light green
O :Orange
R :Red
W :White
Y :Yellow
P :Pink
V :Violet
BBl :Black with Blue tracer
BG :Black with Green tracer
BR :Black with Red tracer
BW :Black with White tracer
BY :Black with Yellow tracer
BlB :Blue with Black tracer
BlG :Blue with Green tracer
BlR :Blue with Red tracer
BlW :Blue with White tracer
BlY :Blue with Yellow tracer
BrB :Brown with Black tracer
BrR :Brown with Red tracer
BrW :Brown with White tracer
BrY :Brown with Yellow tracer
GB :Green with Black tracer
GBl :Green with Blue tracer
GR :Green with Red tracer
GW :Green with White tracer
GY :Green with Yellow tracer
GrB :Gray with Black tracer
GrW :Gray with White tracer
GrR :Gray with Red tracer
GrY :Gray with Yellow tracer
LgB :Light green with Black tracer
LgR :Light green with Red tracer
LgW :Light green with White tracer
LgY :Light green with Yellow tracer
OB :Orange with Black tracer
OBl :Orange with Blue tracer
OG :Orange with Green tracer
OR :Orange with Red tracer
OW :Orange with White tracer
OY :Orange with Yellow tracer
PB :Pink with Black tracer
PBl :Pink with Blue tracer
PG :Pink with Green tracer
VG :Violet with Green tracer
VW :Violet with White tracer
VY :Violet with Yellow tracer
RB :Red with Black tracer
RBl :Red with Blue tracer
RG :Red with Green tracer
RW :Red with White tracer
RY :Red with Yellow tracer
WB :White with Black tracer
WBl :White with Blue tracer
WG :White with Green tracer
WR :White with Red tracer
WY :White with Yellow tracer
YB :Yellow with Black tracer
YBl :Yellow with Blue tracer
YG :Yellow with Green tracer
YR :Yellow with Red tracer
YW :Yellow with White tracer
AIR BYPASS SV VALVE
IDLE AIR CONTROL VALVE
EGR SOLENOID VACUUM VALVE
MANIFOLD ABSOLUTE PRESSURE SENSOR
DISTRIBUTOR
RADIATOR FAN MOTOR
THERMO FUSE
IGNITION COIL
OXYGEN SENSOR
NOISE SUPPRESSOR
MAIN FUSE
HORN (H)
HORN (L)
HEADLIGHT AND FRONT POSITION LIGHT (L)
FRONT TURN SIGNAL LIGHT (L)
SIDE TURN SIGNAL LIGHT (L)
HEADLIGHT RELAY
FUEL PUMP RELAY
HEADLIGHT RELAY
MAIN RELAY


GENERATOR
WARNING CONTROLLER & BUZZER
STARTING MOTOR
HEATER RESISTOR
HEATER BLOWER MOTOR
A/C COOLANT TEMPERATURE GAUGE
A/C SV VALVE
MAIN FUSE
DUAL PRESSURE SWITCH
COMPRESSOR
WIPER MOTOR
ENGINE CONTROL MODULE
FUEL PUMP RELAY
HEADLIGHT RELAY
MAIN RELAY
RADIATOR FAN CONTROL RELAY


SPEED SENSOR
SPEED WARNING BUZZER
HEATER BLOWER SWITCH
COMBINATION METER
SPEAKER (L)
RADIO
A/C SWITCH
CIGARETTE LIGHTER
JUNCTION CONNECTOR
IGNITION SWITCH
OFF
ACC
ON
ST
KEY SWITCH
HAZ ON
HORN
DIODES
SPEAKER (L)
A/C CONTROLLER
POWER WINDOW MOTOR (L)


HEATER BLOWER SWITCH
COMBINATION METER
REAR DEFOGGER SWITCH
LICENCE LIGHT
REAR COMBINATION LIGHT (L)
RADIO
A/C SWITCH
CIGARETTE LIGHTER
SPEAKER (R)
COMBINATION SWITCH
HAZ ON
HORN
OFF
INT
I N T
POWER WINDOW MOTOR (L)

SUZUKI MOTOR CORPORATION

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